# WORLD'S POULTRY SCIENCE JOURNAL

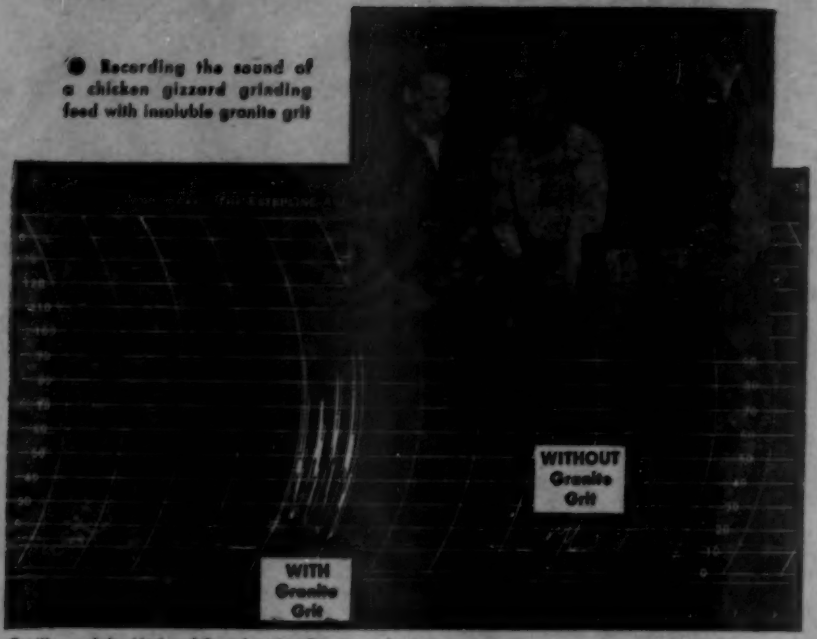
JULY - SEPTEMBER

1955

Official Organ of the

WORLD'S POULTRY SCIENCE ASSOCIATION

Volume 11 - Number 3




● Recording the sound of a chicken gizzard grinding feed with insoluble granite grit

Oscillograph by National Broadcasting Company, Inc.

# EXTRA GRINDING EFFICIENCY NOW PICTURED AND RECORDED

This picture-graph, prepared by the National Broadcasting Company, shows you why birds fed insoluble granite grit break down their feed particles finer for more complete digestion and assimilation—why granite grit helps to provide extra feed efficiency.

The Granite Grit Institute will also be glad to let you hear this extra grinding efficiency. For the first time, the sound of a chicken's gizzard action with and without insoluble granite grit has been recorded by a sensitive microphone and a powerful amplifier.

FREE RECORDING

This vinylite 78 RPM record is yours, free, for playing before groups interested in poultry, poultry research, or the teaching of poultry husbandry. For your copy, simply write the Granite Grit Institute at the address below and tell us how and where you plan to use this educational record.

**GRANITE GRIT INSTITUTE OF AMERICA, INC.**

630 Fifth Avenue, New York 20, N. Y.

# WORLD'S POULTRY SCIENCE JOURNAL

Volume 11 July-September Number 3

*Editor*

GUSTAVE F. HEUSER

*Publication Committee*

H. S. GUTTERIDGE, *Chairman*, Canada

J. R. CAVERS, Canada
J. W. DaCOSTA, Brazil
F. M. FRONDA, Philippines
A. M. GERICKE, South Africa
H. HAVERMANN, Germany
N. ISLAM, Pakistan
M. A. JULL, U.S.A.
E. KARPOFF, U.S.A.
J. W. KINGHORNE, U.S.A.
F. LIEVENS, Belgium
IAN MacDOUGALL, England
N. OLSSON, Sweden
K. SASAKI, Japan
F. A. SKALLER, Australia
W. D. TERMOHLEN, U.S.A.
P. UBBELS, Holland

*Advertising Committee*

O. B. KENT, *Chairman*, U.S.A.

F. W. BRAY, Canada
J. DeBROIN, Canada
H. EBBELL, Switzerland
A. D. GOLDHAFT, U.S.A.
IAN MacDOUGALL, England
C. G. MAY, England
R. T. PARKHURST, U.S.A.
L. PASSEBORN, France
J. D. SYKES, U.S.A.
W. D. TERMOHLEN, U.S.A.
G. de VRIES, Holland
JAN WIJVERKENS, Belgium

*Published quarterly by the*

WORLD'S POULTRY SCIENCE ASSOCIATION

Cornell University, Ithaca, N. Y., U.S.A.

---

Membership dues $3.00 a year of which $2.50 is for a year's subscription to the "World's Poultry Science Journal." Subscription rate, $3.50 a year. Advertising rates upon application.

Entered as second class matter May 31, 1945 at the Post Office at Ithaca, N. Y., under the act of March 3, 1879.

## OFFICERS OF THE WORLD'S POULTRY SCIENCE ASSOCIATION

*President*, Dr. R. Coles (England)

*Honorary Past Presidents*

Professor A. Ghigi (Italy)
Mr. W. A. Kock (Denmark)
Mr. W. D. Termohlen (U.S.A.)
Mr. Alex Wiltzer (France)

*Vice Presidents*

Dr. H. Engler (Switzerland)
Dr. R. F. Gordon (England)
Mr. J. W. Kinghorne (U.S.A.)
Dr. F. Lievens (Belgium)
Mrs. C. S. Th. Van Gink (Netherlands)

*Treasurer and Assistant-Secretary*

Dr. G. F. Heuser (United States of America)

*Secretary and Assistant-Treasurer*

Major Ian Macdougall (England)

*Members of Council:*

*Australia:* F. A. Skaller
*Belgium:* Mr. J. Van Ingelgem and Professor R. Willems
*Canada:* Professor J. R. Cavers, Mr. H. S. Gutteridge, and Mr. G. L. Landon.
*Denmark:* Professor V. Adsersen and Mr. J. Traberg
*Eire:* Mr. D. Philpott
*England:* Mr. J. D. Blaxland, Dr. E. T. Halnan, Dr. C. Horton-Smith, Dr. S. K. Kon, Mr. W. Marshall, Dr. H. Temperton, and Mr. K. Wilson.
*Finland:* Professor N. Westermarck
*France:* Prof. G. Lesbouyries
*Germany:* Dr. A. von Burgsdorff-Garath and Dr. H. Havermann
*Israel:* Mr. A. Livshutz
*Italy:* Mr. F. Garagnani
*Japan:* Mr. Jirohiko Kondo and Prof. Kiyotsuna Sasaki
*Netherlands:* Professor L. de Blieck, Mr. J. D. Tukker, and Mr. P. Ubbels
*New Zealand:* Mr. F. C. Bobby
*Northern Ireland:* Mr. J. G. Rhynehart
*Norway:* Mr. L. Svendsen
*Pakistan:* Mr. Nurul Islam
*Scotland:* Dr. J. Duckworth and Mr. J. E. Wilson
*Siam:* Prof. Luang Suwan
*South Africa:* Professor A. M. Gericke, Mr. J. Hibbert, and Mr. M. S. Letty
*Spain:* Mr. Luis Latorre
*Sweden:* Mr. E. Haeggblom and Professor N. Olsson
*Switzerland:* Mr. H. Ebbell and Dr. E. Hess
*Thailand:* Prof. Luang Suwan
*U.S.A.:* Mr. H. H. Alp, Dr. C. D. Carpenter, Dr. E. M. Funk, Mr. R. M. Hanson, Dr. R. J. G. Jaap, Dr. M. A. Jull, Dr. O. B. Kent, Mr. M. C. Small and Mr. J. D. Sykes

CONTENTS

Hatching Experiments at Beekbergen—Turing the Eggs
R. S. Kaltofen ..... 204

Mother Hen's Diet and Baby Chick's Growth ..... 209

Twenty-five Years of Progress in Starting Rations
G. F. Combs ..... 211

How Temperature Affects Baby Chicks and Layers ..... 213

Promise for Control of Lymphomatosis—Immunized Hens Pass on Resistance to Their Chicks ..... 215

The Potentialities of Poultry Production in Asia and the Far East
H. Engler ..... 217

Dubbing Pullets—Does it Improve Egg Production and Viability?
R. K. Cole and F. B. Hutt ..... 219

Organization of the Netherlands Breeding Program ..... 221

Is Coccidiosis Gaining Resistance to Drugs?
G. H. Snoeyenbos ..... 223

Safeguarding Turkey's Fine Flavor ..... 225

Genetic Improvement Through Hybridization ..... 226

International Award Made ..... 227

Review of Poultry Publications ..... 228

# HATCHING EXPERIMENTS AT BEEKBERGEN—TURNING THE EGGS[1]

R. S. KALTOFEN

*Institute for Animal Husbandry T.N.O., Beekbergen, Holland*

For a couple of years hatching experiments have been carried out at the State Poultry Institute, Beekbergen, in collaboration with the Institute for Animal Husbandry T.N.O. The experiments were meant to increase hatchability in case of artificial hatching.

In artificial hatching part of the germ usually dies during the process. The number of dead germs may vary, but it is always signficant. In the Netherlands, about the time the research was started, the hatchability of artificially hatched eggs in practice amounted to ca. 65% of all eggs set.

In natural hatching, results often are better. Of a good broody-hen all eggs may hatch.

Obviously our research had to start with a series of experiments concerning the broody hen. (2) With the aid of an electric apparatus (a thermo-couple system) the temperature between the eggs underneath the hen could be accurately registered. By the same device an accurate registration of the number of times the broody hen "turns" her eggs was indirectly obtained. According to direct observation she performs this task by raising herself on her legs and rolling over the eggs with her beak. When sitting down again she also "turns" with her body. Naturally the temperature is lowered by some degrees when the hen rises from the nest and this could clearly be observed in the registered temperature-curves. In the same way could be seen how the original temperature was soon restored after the hen had been quietly sitting down again. From this periodic rising and lowering of the temperature it appeared that during the day turning took place with intervals of ½ to 1 hour, and during the night, at least when it was dark, of 1 to 2 hours. This observation has been important for the project of subsequent experiments.

In the Netherlands practice in artificial incubation had been to turn 3 times a day and not at all during the night.

According to a publication of W. M. Insko and J. H. Martin as early as 1933, better results could be obtained by turning more frequently.[1]

Keeping this in mind, it was decided to study the influence of frequent turning in a series of comparative experi-

[1] 75th publication of the Research Institute for Animal Husbandry T.N.O. 58th publication of the State Poultry Institute, Beekbergen.

ments made with the current model of incubator in the Netherlands.

Not every incubator has the same technical system for turning the eggs. In our country the trays, on which the eggs have to be placed, usually are contained in a drum, which may be tilted maximal 45° to the front as well as to the back. By means of a handle which may be manipulated from the exterior of the incubator, the drum can be adjusted to different positions without opening the machine. The two incubators used for the first series of experiments—each with a capacity for 500 eggs—showed this construction.

Next an apparatus was built enabling the handle to be automatically pulled, thereby turning the eggs at equal intervals during the whole of 24 hours. The size of the intervals could be regulated within ample limits and the apparatus could be fitted to each incubator in turn.

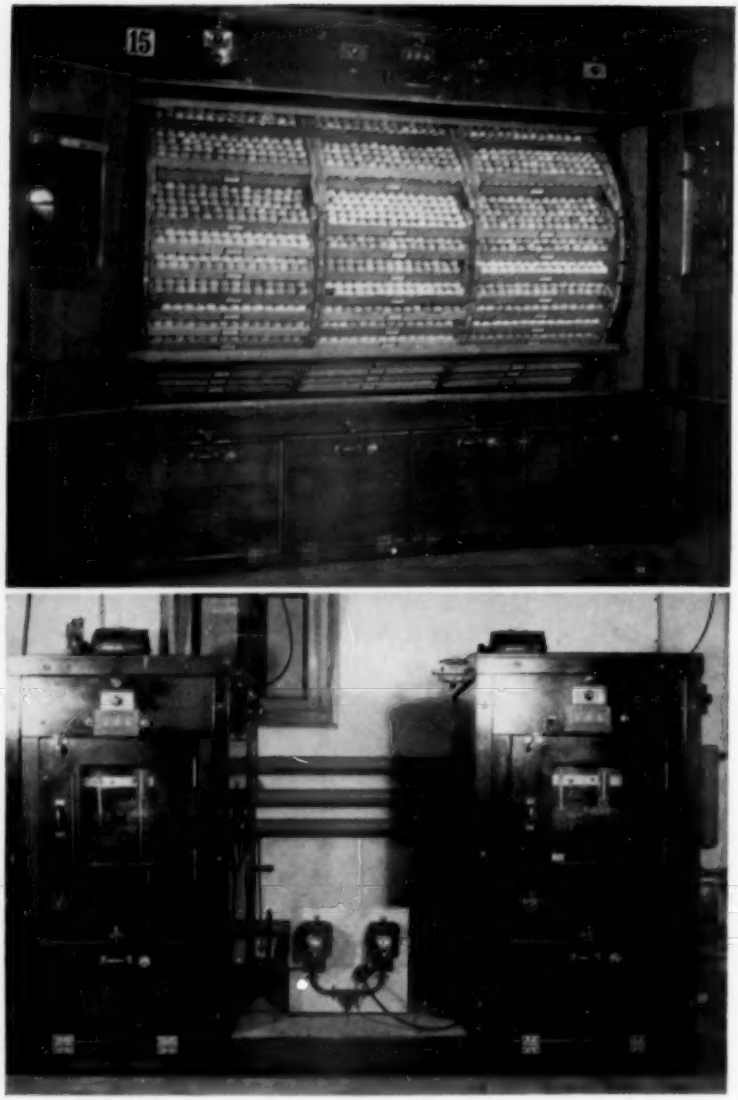
The eggs were placed in the incubators in such a way that both of them always contained an equal number of eggs of the same hen. Moreover care was taken that the average age of the eggs per hen was about the same in both incubators. At the beginning of each experiment the two incubators were packed to the full.

In the first series of 8 experiments a comparison was made between results obtained by turning 3 times a day, by hand, (morning, afternoon and evening) and by turning hourly night-and-day. (2) In either case turning took place from the 1st to the 18th hatching-day, after which the eggs were transferred to the hatching-trays.

In total 5514 eggs were set for these experiments, resulting in a difference of 6% in hatchability in favor of hourly night-and-day turnings against 3 times a day. The difference was significant ($P = 0.001$).

In the unhatched eggs from this series of experiments Visschedijk and Kuiper made inquiries into the effect of frequent turning upon the position of the dead in shell embryos. In total they found more embryos in an abnormal position when the eggs had been turned three times a day. The difference was not quite significant however ($P = 0.065$). It could not be concluded with certainty that the occurrence of a separate malposition had been decreased by turning every hour.[5]

Because in practice incubators of much larger dimensions than those of our experiments are generally used, it seemed advisable to repeat the experiments with a couple of such large incubators. Two big cabinet-incubators, each with a capacity for 16,000 eggs, were used.



Incubators used in hatching experiments. Upper: One of the big cabinet incubators (capacity 16,000 eggs). Lower: Two incubators used in comparative experiments (capacity 500 eggs each).

In these machines hatching proceeded as usual in practice: twice a week, during three months, a maximum of 2000 eggs was set. After three weeks the chicks of the first setting could be removed. The eggs in the first machine were turned 3 times a day until on the 18th day they were transferred to the hatching-trays; those in the other machine were turned hourly night-and-day during the same period of incubation. To counteract the influence of a possible difference in performance of the two machines, the turning-appartus was exchanged in the middle of the experimental period, so that the incubator in which the eggs had been turned 3 times a day during the first half of the experiment, had the eggs turned hourly night-and-day during the second half. Simultaneously with the exchange of the turning-apparatus, the eggs at that moment in the first incubator were transferred to the second and, inversely, the eggs of the second incubator to the first one.

In total 60,000 eggs were set for this experiment. Hatchability of the 3 times a day turned eggs amounted to 68%, that of the hourly night-and-day turned eggs to 74%. Once more it appeared that a more frequent turning resulted in a 6% increase in hatchability.[4]

Some investigators have maintained that no advantage could be gained by turning more than 8 times per 24 hours. In order to test this statement, another series of experiments was started, in which a detailed examination was made of the differences in hatchability between settings receiving hourly night-and-day turnings and settings receiving 8 turnings per 24 hours (every 3 hours). The experiments took place in the small incubators which had been used for the first series of experiments. The hatching-method was also the same, but now *both* machines were provided with an automatic turning-apparatus.

A series of 6 experiments was carried out, for which 3876 eggs were set in all. As a result, hatchability in case of hourly night-and-day turnings proved to be 3% higher than in case of 8 times turning per 24 hours. The difference was significant ($P = 0.02$). This means that, when using the above-mentioned type of incubator, a better hatchability will result from 8 times turning per 24 hours than from 3 times turning a day, but that even considerably better results will be obtained by hourly night-and-day turning.[5]

By candling the eggs during the hatching-period it is possible to watch the development of the embryo. Dead germs can easily be distinguished from those normally developed. Apart from this, candling always reveals that in a number of eggs

the germ has not developed at all. These are usually called infertile eggs.

In the experiments with the small incubators the eggs were candled twice during the hatching-period; once on the 5th and once on the 16th day. In the experiments with the large incubators each hatch was once candled, namely on the 8th day. These candlings enabled us to get an idea of the mortality-distribution over the whole of the hatching-period. The picture could be supplemented by data obtained from opening and examining the dead-in-shell eggs from which no chicks hatched.

In studying these data two characteristic points were observed:

1. With increasing percentage of fertile eggs hatchability, as rated against the number of fertile eggs, also increased. This may be explained by keeping in mind that eggs listed as infertile are not always really infertile. It is a fact that among the eggs removed by candling as "clear," there are always some that have actually been fertilized; their germs, however, have died at a very early stage, sometimes even before the hatching process started. Percentage of fertile eggs, as determined by candling, may therefore be low owing to the presence of a large number of such early dead germs. If so, the percentage of fertile eggs will be an indication for embryonic viability. In this way a low percentage of fertile eggs will stand for a decreased viability, entailing a higher mortality rate during the incubating period, which in its turn results in a hatchability rating lower against the number of fertile eggs.

2. When the mortality-distribution of the 3 times a day turned eggs was compared to that of the hourly night-and-day turned eggs, a lower mortality-rate during the second week of incubation appeared to have contributed importantly to the higher hatchability of the latter. As mentioned before, the eggs were turned from the 1st up to and including the 18th hatching-day. The question now arose whether frequent turning is important only during the second week of incubation, or whether frequent turning before and after this period also reduces mortality.

In a new series of experiments we are trying to find the answer to this question, the eggs in one machine being turned hourly night-and-day from the 1st up to and including the 18th hatching-day, while in the other machine hourly night-and-day-turnings only are made from the 6th up to and including the 14th day. In the latter machine from the 1st up to the 6th day inclusive and from the 14th up to the 18th day inclusive

only four turnings a day are taking place. (For technical reasons four night-and-day-turnings were preferred to three by day.)

The first 6 settings amounted to a total of 3698 eggs. Hatchability appeared to be about the same with either treatment. The mean difference of ca. 0.2% of the eggs set was in favor of those which had received hourly night-and-day turnings from the 1st up to and including the 18th day. As a preliminary result we may assume already that in our incubators turning during the second week of incubation is the main factor in reducing mortality during the incubation period. Experiments are continued.

Till now the question in which way exactly the embryonic development is influenced by turning remained a moot point.

REFERENCES

1. Insko, W. M., and J. H. Martin, 1933. *Poultry Sci. 12:* 282-286.
2. Kuiper, J. W., and P. Ubbels, 1951. *Poultry Congress, Paris 1951, Vol. 1:* 105-112.
3. Kaltofen, R. S., en P. Ubbels, 1953. *Instituut voor Veeteeltkundig Onderzoek T.N.O. Mededeling no. 70; Rijksinstituut voor Pluimveeteelt, Beekbergen. Mededeling no. 52.*
4. Ubbels, P., 1953. *Rijksinstituut voor Plumveeteelt, Beekbergen. Mededeling no. 50.*
5. Visschedijk, A. H. J. und J. W. Kuiper, 1955. *Instituut voor Veeteeltkundig Onderzoek T.N.O. Mededeling no. 77; Rijksinstituut voor Pluimveeteelt, Beekbergen. Mededeling no. 57.*

---

## MOTHER HEN'S DIET AND BABY CHICK'S GROWTH

Human nutrition is the life work of some Agricultural Research Service scientists. One member of this group is F. A. Csonka, who is particularly interested in finding out how maternal diet affects embryo development.

Csonka is exploring this question in terms of the effect of a hen's feed on the growth of her chicks.

With the hen, housing and diet control are comparatively simple. Then, too, an embryo grows all the way from cell to chick in just 3 weeks. And the embryo's entire food supply, enclosed in the shell of an egg, is easily analyzed.

The egg includes seven different proteins, each made up of certain amino-acid building blocks. Csonka and his associates discovered that they could change the proportion of two of these amino-acids—cystine and methionine—by changing the hen's ration. That is, on a high-protein diet with casein or soybean, a hen lays eggs that are richer in cystine and methionine than she does on a low-protein diet in which corn is the main source of protein.

Suppose these eggs were hatched—would there also be a difference in the growth of the chicks? The scientists did find a difference, but it wasn't directly related to the increase in cystine and methionine in the egg. Chicks from casein-fed hens outgained chicks from the hens on a high-protein soybean ration as well as those on a low-protein corn diet.

It now appeared that casein carries a previously unrecognized growth factor—a different one from the vitamin $B^{12}$ normally associated with casein, liver, and cow manure—and that this new factor can be transmitted from the hen's diet to the chick just as vitamin $B^{12}$ can.

This is confirmed by Csonka, R. J. Lillie, and W. F. Martin. They fed four groups of 30 Rhode Island Red pullets on various rations for about 13 weeks. Then they reversed the proteins—but not the supplements—in these diets and began to collect eggs again after 2 weeks. The results show that—

1. On unsupplemented mash, chicks from hens fed a ration containing casein grew faster than chicks from hens on a corn ration. This holds true for both long-period experiments and the short-range experiments.
2. Adding vitamin $B^{12}$ to maternal rations fed over a long period stimulated the growth of chicks on unsupplemented mash. $B^{12}$ was much more effective when added to the hen diet than it was when added to the chick diet. However, the differences in chick growth aren't entirely related to $B^{12}$. In the maternal diets fed only a short time, $B^{12}$ was ineffective. It was somewhat more stimulating when added to the chick mash.
3. Cow manure improved the growth of chicks when the hens had been on a diet for a long period. After the maternal diets were reversed, however, cow manure in the chick mash didn't improve growth.
4. Using both cow manure and $B^{12}$ in the chick mash suppressed growth in most long-period trials, but had little effect in the others.

Several findings stand out: the unidentified growth factor in casein . . . the discovery that $B^{12}$ or cow manure in the chick diet may inhibit as well as promote growth, depending on the hen diet and the length of time it is fed . . . the sexual differences in chick reaction . . . the general drop in chick growth levels following the changes in maternal diets. (Agricultural Research, U.S. Department of Agriculture, Washington, D. C.

# TWENTY-FIVE YEARS OF PROGRESS IN STARTING RATIONS

G. F. COMBS

*University of Maryland, College Park, Md., U.S.A.*

More progress has been made during the last few years in the formulation of rations for poultry than for any other farm animal. At the present time, broiler chickens are being reared to marketable weights with considerably greater effi-

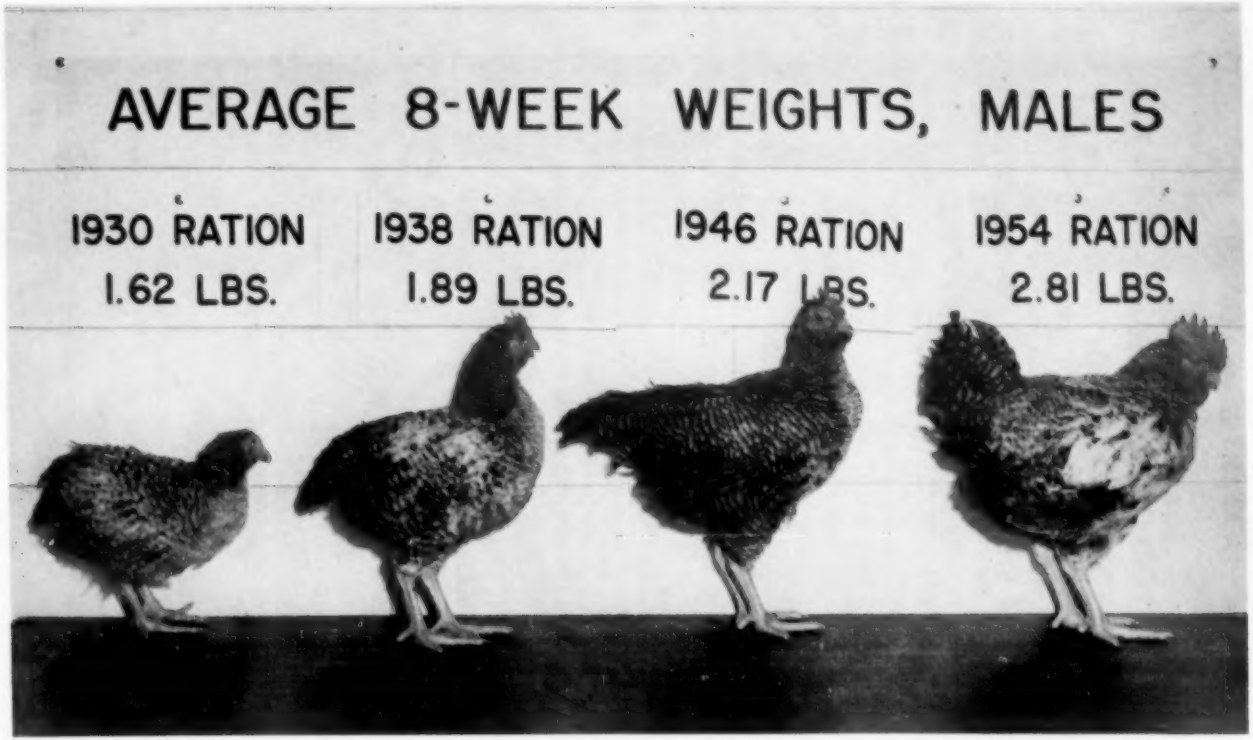
COMPOSITION OF RATIONS USED

| Ingredients | Mo.-1930 Ration | Md.-1938 Ration | Md.-1946 Ration | Md.-1954 Ration |
|---|---|---|---|---|
| | | lbs./ton | | |
| Gr. Yellow corn | 1000 | 400 | 520 | 1108.33 |
| Oat groats | — | 400 | — | — |
| Oats, plv. | — | — | 250 | — |
| Wheat, std. midds. | 300 | 400 | 200 | — |
| Wheat bran | 300 | 400 | 250 | — |
| Fish meal | — | — | 150 | 100 |
| Cond. fish sol. | — | — | — | 40 |
| Meat scraps | — | 200 | 150 | — |
| Dr. skim milk | 300 | 200 | 100 | — |
| Soybean oil meal | — | — | 100 | 400 |
| Corn gluten meal | — | — | 100 | 75 |
| DL-Methionine | — | — | — | 1 |
| Dried brewers' yeast | — | — | — | 40 |
| Dried whey prod. | — | — | — | 40 |
| Ferm. solubles (80 mcg. riboflavin/gm.) | — | — | 25 | — |
| Dhy. alfalfa meal | — | 100 | 100 | 40 |
| Soybean oil | — | — | — | 80 |
| Limestone | — | — | 30 | 30 |
| Bone meal | 80 | — | 15 | 20 |
| Dicalcium phosphate | — | — | — | — |
| Salt | 20 | 10 | 10 | — |
| Salt, iodized | — | — | — | 8 |
| Manganese sulphate | — | 0.25 | 0.25 | 0.4 |
| D-Activated animal sterols (1500 ICU Vit. $D_3$/gm.) | 1* | 1* | — | — |
| Vitamin A & D oil (300 ICU Vit. $D_3$/gm.) | — | — | 4 | — |
| Stab. Vit. A & D Conc. (4000 IU Vit. A, 750 ICU Vit. $D_3$/gm.) | — | — | — | 3 |
| Choline chloride, 25% mix | — | — | — | 4 |
| Diphenylparaphenylenediamine | — | — | — | 0.25 |
| Arsanilic acid, 20% mix | — | — | — | 1 |
| | | Gms./ton | | |
| Niacin | — | — | — | 25 |
| Calcium pantothenate | — | — | — | 5 |
| Riboflavin | — | — | — | 4 |
| Vitamin $B_{12}$ | — | — | — | .006 |
| Procaine Penicillin | — | — | — | 4 |

*—Added to replace direct sunlight.

AV. WEIGHT AT 8 WEEKS

| | 1930 | 1938 | 1946 | 1954 |
|---|---|---|---|---|
| Av. weight, males, lbs. | 1.62 | 1.89 | 2.17 | 2.81 |
| Av. weight, females, lbs. | 1.36 | 1.68 | 1.98 | 2.16 |
| Av. weight, both sexes, lbs. | 1.49 | 1.79 | 2.07 | 2.49 |




Representative birds from each experimental group show progress made in feed quality since 1930.

ciency than was possible a few years ago. To illustrate the remarkable progress which has been made, four lots of 20 New Hampshire x Barred Plymouth Rock Crossbred Chicks each were fed different rations, formulated at 8 year intervals during the last 24 years. One of these rations was recommended for confinement rearing in 1930 (U. of Mo. Cir. 244, 1930). A vitamin D source was added to replace the need for sunlight. Two others were given in Univ. of Maryland Circular 61, 1938, and Univ. of Maryland Bulletin 109, 1946, respectively. The fourth, or 1954 ration, was a practical broiler ration formulated by the authors. The results obtained at eight weeks of age are shown in the table and figure. Since the chicks were obtained from the same source and reared under similar management conditions, the differences in growth can be attributed entirely to the improvements made in the rations. It is of interest to note that more progress has been made during the last eight year period than during either of the two previous eight year periods based on the results of this trial. This should provide encouragement to those who believe further progress is still possible, and that much more is still to be learned about the formulation of poultry feeds.

---

## HOW TEMPERATURE AFFECTS BABY CHICKS AND LAYERS

What's the best brooding temperature for baby chicks? And what temperature gets the best performance out of laying hens? USDA scientists have just made some interesting findings on both questions.

Results of poultry environmental studies at the Agriculture Research Center, Beltsville, Md., show that—

1. A relatively high brooding temperature of 86° F. gets chicks off to a fast start. But after 5 weeks, chicks brooded all the way at 67° gain weight more rapidly.

2. Kept under constant-temperature conditions, hens lay the most eggs with the least feed per egg at 55° F. The studies showed, however, that egg production was only 5 to 10 percent lower at other constant test temperatures from 40° to 75°.

These results mark the beginning of what cooperating ARS agricultural engineers and poultry husbandmen believe will be an important accumulation of fundamental information. It will help the engineers develop better structures and equipment. And the poultrymen will gain new knowledge of

how environment affects the physiology and nutrition of chickens.

The studies are carried on in two oversized calorimeters. These 5- by 7-foot boxes help scientists observe how different temperatures, humidities, and air speeds affect chickens. In some instances, the effects are measured in terms of heat and moisture given off in eggs, respiration, and droppings.

Agricultural engineers Hajime Ota and H. L. Garver designed and built the calorimeters and are now operating them. Poultry scientists working with the calorimeters include E. H. McNally, R. J. Lillie, J. R. Sizemore, W. E. Shaklee, M. H. Conner, and W. Wilson (on sabbatical leave from University of California).

In the brooding tests, 70 1-day-old New Hampshire chicks were placed in each calorimeter. One—the "hot box"—was maintained at 86°, the other—the "cold box"—at 67°. As the test progressed and the birds grew, the number of chicks in each calorimeter was cut to 35 to prevent crowding. The temperature under the hover of each calorimeter was 95° at the beginning of the test; this was lowered 5° each week until the calorimeter's constant temperature level was reached. Relative humidity in both cabinets was near 75 percent.

Chicks in the hot box were very active and ate normally —unlike the obviously chilled cold-box chicks, which spent much of their time under the hover. Then, chicks in the cold box began to narrow the weight difference. On the 38th day of the test, they matched the hot-box chicks in average weight. And during the remainder of the test period, until they were 13 weeks of age, they continued to grow away from the hot-box birds. During the last 5 weeks, birds in the hot box were panting.

At the end, male birds brooded at 67° averaged 3.36 pounds (New York-dressed weight), males brooded at 86°, 2.94 pounds. Females from the cold box averaged 2.66 pounds, those from the hot box, 2.48 pounds.

Researchers observed that birds reared in the cold calorimeter feathered first. Those in the hot box developed sexually more rapidly. Hot-box roosters crowed at 7 and 8 weeks. Postmortem examination revealed that the stress of colder environment had significantly enlarged the hearts and thyroid and adrenal glands of the chicks brooded at 67°.

The constant-temperature laying tests, which established 55° as the optimum for efficient egg production, were carried out with Rhode Island Red hens. Relative humidity ran about 75 percent in the chambers.

Of course, most poultrymen probably would find it unprofitable to maintain laying-house temperatures at 55°. Only severe temperatures — below 40° and above 70° — caused marked drops in egg-production efficiency. At 23°, the lowest temperature tested, production averaged 26 percent. At 85°, the highest temperature, production ran 50 percent. Production hit 75 percent at 55°.

Temperature effect measured in feed consumption showed hens at 23° eating 12.3 pounds of feed for every pound of egg laid; at 85°, 4 pounds of feed; and at 55°, 3.5 pounds.

The scientists are improving their equipment and techniques as these studies move ahead. The findings may take on increasing importance for egg and broiler producers. (Agricultural Research, Vol. 3, No. 6, Dec. 1954, Agricultural Research Service, U.S. Dept. of Agriculture, Washington, D.C.)

---

## PROMISE FOR CONTROL OF LYMPHOMATOSIS— IMMUNIZED HENS PASS ON RESISTANCE TO THEIR CHICKS

USDA scientists have succeeded for the first time in immunizing chickens against the costly cancerous disease called visceral lymphomatosis, or *big-liver disease.*

In experiments at the Regional Poultry Research Laboratory, East Lansing, Mich., resistance to lymphomatosis was passed from vaccinated hens to their chicks through the eggs.

The ARS researchers hope this discovery may eventually bring the $50-million-a-year disease under control. Their findings must, of course, be verified first under a variety of conditions, the vaccination technique greatly simplified, and vaccine production put on a practical basis.

These results from vaccination follow closely another significant development at the East Lansing Laboratory—a diagnostic technique that may prove important in identifying the visceral form of lymphomatosis (Agr. Res., Nov. 1954, p. 4; also June 1954, p. 4). See also World's Poultry Science Journal. Vol. XI, No. 1, p. 30, Jan.-Mar. 1955. The laboratory is jointly administered by ARS and several State experiment stations.

In the recent work on this disease, biologist B. R. Burmester and associates vaccinated hens with a dilute preparation of the visceral-lymphomatosis virus. This preparation was made from diseased chicken livers. In due course, the hens' chicks showed high resistance when tested with potent injections of the virus.

Burmester thinks that vaccination resulted in a buildup in the hens' blood of protective antibodies, substances which the body creates to inactivate disease organisms. Apparently these antibodies were passed in through the eggs to the chicks.

The evidence in this study was gathered from 300 chicks, the progeny of 14 test hens. The chicks from eggs laid *before vaccination* of the hens proved highly susceptible to the disease. Two-thirds of these chicks died of the disease after receiving injections of the virus.

In marked contrast to this, chicks of the same parentage from eggs laid *after their mothers were vaccinated*—in fact, only a few weeks after the laying of the first batch of eggs—had a much smaller incidence of the disease. Only a few of them died of the tumors. Mother-vaccination was the only observable difference between the two groups of chicks.

The East Lansing study used White Leghorn hens of a highly-susceptible strain. These birds—like all other chickens—gain resistance to lymphomatosis as they get older. Therefore, the researchers chose mature birds, which would have a good chance of surviving vaccination.

Before vaccination began, the hens' eggs were collected for 6 weeks and incubated. Then vaccination was started. A preparation containing live virus in low concentration was injected into the hens' veins on alternate days for a week. For the following 3 weeks, thrice-weekly injections were given, using a 10-times-larger dose of the virus preparation. After 10 days, a final injection of this strength was given. Then, starting a week later and continuing for 6 weeks, test eggs from the vaccinated hens were collected and incubated.

To check susceptibility of the chicks, researchers inoculated them with preparations of the active virus that in previous studies had proved potent enough to induce the disease in a high percentage of susceptible chicks. Forty-one to 70 percent of the chicks from non-vaccinated hens receiving inoculations developed tumors and died. Only 3 to 13 percent of chicks from vaccinated hens developed the disease, and on the average they survived longer than susceptible chicks in the other group.

All diagnoses of lymphomatosis were established through post-mortem examinations in the laboratory. (Agricultural Research, Vol. 3, No. 10, April, 1955. United States Department of Agriculture, Washington, D.C.)

# THE POTENTIALITIES OF POULTRY PRODUCTION IN ASIA AND THE FAR EAST

H. ENGLER

*Poultry Specialist, Animal Production Branch, Agriculture Division, Food and Agriculture Organization of the United Nations, Rome, Italy*

According to an FAO survey there is a great variation in consumption of eggs in the different regions of the world varying from 0.1-1 kg. of eggs per person per year in the Far East, and increasing as one comes westward, reaching an upper limit of 17-23 kg. in Northern America.

While Asian and Far Eastern countries have the world's oldest tradition in poultry keeping, birds generally do not occupy a prominent place in farming operations on the average farm but function more as scavengers and utilisers of table and other refuse.

Because of the low protein diet in most Asian countries, bearing in mind the cheapness with which poultry husbandry can be rapidly improved, it becomes particularly desirable to increase egg and poultry meat in most South Asian and Far Eastern countries.

During the last 30 years the U.S.A. has witnessed an increase in the average egg production from 116 to more than 180 eggs per hen per year, resulting in 12% of the total farm output now coming from chickens and eggs. Similar progress has been made in some European countries.

During recent years improved methods of poultry husbandry have been reported, particularly from Burma, Ceylon, Japan, India, Malaya, Pakistan, the Philippines, Thailand and Viet Nam. Yet, data collected by FAO show that the average annual egg production per laying hen still varies from about 40-80 eggs in some countries of the region. This indicates that there are still great possibilities for further progress.

The increasing popularity of eggs is mainly justified by their possession of the essential food nutrients, viz. 12.4% protein, 11.7% fat, 0.9% carbohydrate, 1.0% ash and the balance in water; giving a calorific food value of 163 per 100 g. of eggs. The egg protein is considered as being most favorably balanced for human nutrition because it indicates no deficit of essential amino acids and is particularly rich in arginine, methionine and phenylalanine.

Furthermore, eggs are an important source of vitamins A, D, $B_1$, $B_2$, and Pantothenic Acid, whilst poultry meat in

addition to protein contains remarkable quantities of thiamine and riboflavine.

Concerning the relative efficiency in converting feed into food by the various classes of livestock, Jull (1951) stated: "From the standpoint of proteins and vitamins, milk production is the highest in the efficiency of animal production. Egg production ranks second in efficiency. Chicken, duck, goose and turkey meat production rank above beef and lamb production in efficiency, although beef cattle and sheep utilize forage crops to a greater extent than the various classes of poultry mentioned except geese." The fact should not be overlooked, however, that efficiency of total feed utilization depends very much on the relation between the quantity of feed for maintenance and feed for production. The higher the production per animal the better efficiency in converting feed nutrients into food.

Development of a more efficient poultry industry in any particular country or region requires careful consideration of all the many aspects involved. Accordingly, the Food and Agriculture Organization of the United Nations will organize a Technical Meeting on Poultry Production for Asian and Far Eastern countries in Poona, India, from 17-27 October 1955 for which the Government of India and the Government of Bombay State have kindly consented to act as hosts. It is hoped that FAO member governments will nominate competent delegations to attend the meeting and cooperate in order to make it a success.

---

## TECHNICAL MEETING ON POULTRY PRODUCTION IN ASIA AND THE FAR EAST

This technical meeting, held under the auspices of the Food and Agriculture Organization of the United Nations, is being convened to consider and determine the best methods of poultry breeding, feeding, and management under different climatic and other conditions, and to coordinate research work thereon. The Government of India and the Government of Bombay have agreed to act as hosts. It will be held in Poona (Bombay State) October 17-27, 1955.

# DUBBING PULLETS—DOES IT IMPROVE EGG PRODUCTION AND VIABILITY?

R. K. COLE and F. B. HUTT

*Department of Poultry Husbandry, Cornell University, Ithaca, N. Y., U.S.A.*

Not all parts of an animal's anatomy are essential to its welfare. Sheep are docked, cattle are dehorned, and a dog's ears and tail may be cropped. In spite of the loss of these parts, such animals lead normal productive lives. In the domestic fowl the comb and wattles can be cut off with scissors or a sharp knife. This process of dubbing need not be accompanied by any severe bleeding nor any adverse effect on the birds.

During periods of production, the comb and wattles are rather large and bright red from the increased circulation of blood. At such times, the comb may be so large as to interfere with normal eating and drinking. It also provides vulnerable points for attack by the more pugnacious birds in the flock. In really cold weather the comb and wattles may be frostbitten. Actually no essential function is known for these structures. Khaki Campbell ducks, which are without head ornaments, may lay even better than the best strains of domestic fowl.

Dubbing cocks is a practice of long standing, both of the pit-game fighting birds, and of the Leghorns kept in northern latitudes. Dubbing of females has been practiced in recent years by a number of poultrymen, but their reasons for so doing are varied. Some dub day-old pullet chicks as a means of identifying their strain.

The first published account of the effects of dubbing on laying birds came from Australia in 1942. Since then investigators in England, Hawaii, and the United States have measured the effects of dubbing on egg production, but in relatively small groups of birds. There have been no consistent beneficial effects revealed by these tests. In some, however, the dubbed birds laid much better than the non-dubbed control hens.

To test the effect of dubbing on egg production and viability, half of the pullets raised in 1949 and in 1950 at Cornell were dubbed at 8 weeks of age. At this time both the comb and wattles can still be removed without any bleeding. The dubbed pullets were kept mixed at random with the controls throughout the full period of the experiment to 500 days of age. Various records on performance were kept for each bird,

and at the end of the period they were summarized separately for each group. Any bird that died during the period was autopsied and the cause of death determined, where possible.

## EGG PRODUCTION

In the 2 years, there were 7 different groups of pullets from the Cornell strains of White Leghorns which had been bred for resistance or susceptibility to leucosis. Half of each group had been dubbed. In 6 of these groups the dubbed birds that lived to the end of the 500-day period laid a few more eggs than did the controls. The totals for all birds were as follows:

| Year | Pullets (no.) | Average egg production | |
|---|---|---|---|
| | | Dubbed (no.) | Controls |
| 1949 | 2,971 | 190 | 188 |
| 1950 | 2,511 | 181 | 175 |

For all birds, in both years together, the dubbed ones laid an average of 3 eggs more than did the controls.

A study of the distribution of egg production over the year showed that any advantage from the dubbing was to be found during the cold months of the year. In general, the dubbed birds laid consistently better during the period from October to March. During the following summer, however, the non-dubbed birds tended to lay a little better and thus the overall advantage for the year was somewhat reduced. In Wyoming, where the winters are long and severe, groups of dubbed pullets laid about 20 per cent better than did their non-dubbed controls.

## VIABILITY

There were some minor but inconsistent differences in mortality between the dubbed groups and their controls. When all the data for the 2 years were combined, the mortality was identical in both groups—28.9 per cent. This figure may seem a little high, but it covers all mortality in the period from 43 to 500 days of age for unculled populations, and approximately 20 per cent of the total number of birds were from the Cornell strain bred for high susceptibility to leucosis.

Although the dubbed birds started to lay about 2 days later than the controls in the first year, there was no similar difference among pullets for the second year. Dubbing had no effect on mature body weight of these hens.

These results on more than 5000 pullets indicate that in south-central New York State dubbing pullets will not result in

any appreciably better production or viability. In areas of the country where the winters are more severe, it might prove to be more beneficial. It is clear that the comb and wattles are not essential to good production and viability. If the benefit from dubbing were even as small as 3 eggs per bird per year, as these experiments indicate, it would be worth the time and effort needed to dub. It would also result in a more uniform appearance of the birds in the flock. (Farm Research 21:16, Jan. 1955, New York State Agr. Exp. Sta. at Geneva, N.Y., and the Cornell University Agr. Exp. Sta. at Ithaca, N.Y.)

---

## ORGANIZATION OF THE NETHERLANDS BREEDING PROGRAM*

The Dutch poultry industry is based on a sound, rigidly controlled breeding program, which can be divided into four phases. (1) There are about 200 licensed chicken breeders in the country, whose farms are under strict supervision of the inspectors of the Control Board for Poultry and Eggs. Two separate flocks are kept on these farms (the total population ranges from 1,000-5,000 birds). There is a small, high-standard flock which produces the hatching eggs for the larger breeder or production flock. (2) The eggs obtained from the larger flock are sold to licensed producers of hatching eggs. (3) These producers, in turn, are authorized to sell hatching eggs to commercial hatcheries. (4) Finally, the commercial hatcheries sell one-day chicks to poultry farms. All transactions from unit to unit must be covered by certificates or semi-official coupons to assure the rigid system of control.

The hatching season stretches from November to April so as to spread deliveries of eggs evenly over the year. Production during calendar year 1954 was divided as follows: 1st quarter 23.8%; 2nd quarter 24.9%; 3rd quarter 23.7% and 4th quarter 27.6%.

*Duck Breeding*: It is centered in the northern part of Gelderland province, where four large breeders operate in one town—Ermelo. The Khaki-Campbell breed is generally used in the Netherlands for production of eggs. Many years of experience and rigid selection have enabled Dutch breeders to produce a bird with an average 325 eggs per year. Birds

* This material was prepared by Herbert W. Ford and is based upon a report of Mr. George J. Dietz, Agricultural Attache, The Hague.

for domestic consumption, the Peking variety, are produced by three breeders and about 60 fatteners. This is a relatively new industry started in 1946 with 13 hatching eggs, reportedly imported from Germany. In 1954, about 300,000 dressed birds were sold and the bulk exported. It is expected that about 600,000 birds will be killed in the cooperatively owned packing plant during 1955. It is interesting to note that a very modern method of Dutch origin is used to remove the last stubble from the skin. The birds are dipped in wax, which is later pulled off, removing at the same time all the remaining stubble. The wax can be used again. The cooperative had, in addition to the sale of birds, an extra income of about $263,000 obtained from sale of feathers and down.

*Cross Breeding*: During 1953, about 60 percent of all eggs sold to hatcheries were from single cross matings. In 1954, this percentage rose to over 65 percent. Most important breeds include White Leghorns (19.3%) and Rhode Island Reds (13.2%). Some producers have been granted permission to raise crossbreeds from three different breeds, however, the experience gained was not favorable and this practice according to the authorities will not be permitted in the future.

*Hybrid Breeding*: Dutch breeders plan to commence a "hybridization program," based on cooperation among all 200 breeders. Lack of capital and rather small private flocks make an individual approach to this program impossible. The organization of the present Dutch breeding program will be used as a model for this new enterprise. This will enable all interested groups to keep close supervision of the development and operation of the new hybrid program. Two of the largest Dutch feed supply cooperatives will finance and supervise the program. About 20 important poultry breeders will work together with the cooperatives. Development of this "hybridization" by the cooperative was, for the most part, stimulated by the initiative and interest of a private Dutch feed indusry, a local representative and interest of a private Dutch feed industry, a local representative of a U.S. hybrid firm. This company will, if present difficulties caused by many Dutch regulations are overcome, be able to supply farmers with hybrid chicks by 1956-57. To overcome these difficulties, this firm has started a "breeding" farm so the last meeting will occur in the Netherlands. According to local regulations, the sale of one-day old chicks from imported hatching eggs is forbidden. (Foreign Agriculture Circular FPE 2-55, March 8, 1955, U.S. Department of Agriculture, Foreign Agricultural Service, Washington, D.C.)

# IS COCCIDIOSIS GAINING RESISTANCE TO DRUGS?

G. H. SNOEYENBOS

*Department of Veterinary Science, University of Massachusetts Amherst, Mass., U.S.A.*

Occasionally flocks on recommended levels of a coccidiostatic drug suffer severe outbreaks of coccidiosis. More frequently, the poultryman suspects that severe mortality is imminent and uses additional medication. The question is raised whether resistant strains are developing which are resistant to drugs now used to control them.

Infection following exposure to coccidia occurs with all of the commonly used coccidiostats. They do greatly reduce the degree of infection following exposure. It is essential, however, that some infection occurs to stimulate the development of immunity. Also, some degree of infection by all of the forms of coccidiosis should occur if the birds are to be adequately protected in later life.

At the levels of coccidiostats commonly used, which are necessarily low because of cost and possible toxicity at higher levels, a small percentage of birds may show clinical symptoms or may die. This should be considered a normal relationship between the disease, the flock and the drug. The few sick or dead birds which occur usually appear at the time that a majority of the flock is already immune to the particular species causing symptoms. Additional medication at this time gives little or no benefit.

All five of the damaging species of coccidia in chickens may occur successively or in any combinations, and infection with one species develops no immunity to later infection by other species.

If severe field losses from the disease occur while the birds are on a coccidiostat, it is more an indication of poor management rather than of drug failure. Infection can be so overpowering that the relatively low levels of the drug fail to provide adequate protection.

The disease is all too frequently incorrectly diagnosed. Disturbances from entirely different causes are often considered to be coccidiosis. The obvious anemia associated with the hemorrhagic syndrome is a prime example. Also confusion results from the recognition of coccidiosis in individual birds which do not represent the flock. The quantity of infection, in affected birds and in the flock as a whole, must be considered to accurately diagnose coccidiosis in medicated flocks.

Most laboratory work reported so far indicates that the organism is as susceptible to presently used cocciodiostats as it was at the time field medication was started. At least one sulfonamide resistant strain has been found (and it is likely that in some cases a degree of resistance has developed to all commonly used coccidiostats). However, field results indicate that the drugs are still doing an effective job and that in most cases they are highly reliable.

A short time ago a tremendous tonnage of feed medicated at a high level was used in conjunction with continuous low level medication. High level medication was commonly used whenever there was clinical evidence of coccidiosis. Many growers thought such a procedure was necessary and sometimes as much as 30 per cent of their total tonnage consisted of treatment levels of coccidiostats. This procedure is seldom necessary. It is highly wasteful. Many of these growers have since discontinued all high level medication and report no more damage from coccidiosis than previously.

Outbreaks after an initial 10-12 weeks of continuous medication sometimes occur. This is a result of massive exposure to a species which did not occur during the medication period in sufficient quantity to produce immunity. However, field experience indicates that medication for the first 10-12 weeks is usually sufficient to allow the development of immunity to all pathogenic species.

---

## PUBLICATIONS OF THE UNION OF INTERNATIONAL ASSOCIATIONS

YEARBOOK OF INTERNATIONAL ORGANIZATIONS. *Ed. 1954-55.* An authoritative guide of 1200 pages entirely revised with the assistance of the United Nations Secretariat. Describes 1138 different international organizations (119 inter-governmental and 1017 non-governmental) giving status, history, purposes, members, structure, officers, finances, relations with other organizations, activities, publications. Price 10 dollars, 70/—or equivalent (postage included).

ASSOCIATIONS, a 60 page illustrated magazine, 12 issues a year, containing studies, surveys and the well-known calendar of forthcoming international meetings.

The above publications may be obtained from:

Union of International Associations
Palais d'Egmont
Brussels, Belgium

## SAFEGUARDING TURKEY'S FINE FLAVOR

True flavor and fragrance of cooked turkeys are so popular that any tinge of fishiness or other off-flavor in the meat is something growers are most anxious to avoid.

Reassurance to growers—and consumers as well—that antibiotics in turkey diets aren't likely to affect meat flavor comes from experiments conducted at the Agricultural Research Center, Beltsville, Md.

Antibiotics such as penicillin and terramycin are so effective in speeding the growth of young turkeys and chickens that almost all commercial starting feeds now contain one of these chemicals, says Agricultural Research Science poultry scientist Stanley Marsden.

(The most widely held view is that they kill off organisms that hinder full growth—based on the fact that germ-free chickens in laboratories grow surprisingly well and get no extra boost from antibiotics in their diet.)

For the experiments, chlorotetracycline (Aureomycin) was chosen as typical of the widely used antibiotics. Beltsville Small White turkeys, fed experimental diets to various ages, were cooked and judged for eating quality under direction of food specialist Mary T. Swickard.

She found no differences in palatability between birds that got the antibiotic and those that did not.

Mrs. Swickard had a different report, however, on the flavor effects of too much fish products.

In recent years, ARS scientists have advised reducing fish meal and fish oil in turkey rations because research showed that fishy flavor was detectable in the cooked meat.

In the latest experiments, birds with and without antibiotic were fed reduced amounts of fish products. Even so little as 5 percent menhaden fish meal and 0.25 percent vitamin A and D fish oil caused dark meat and skin of roasted turkeys 14 and 16 weeks old to carry off-flavor.

Growers marketing these young birds are now advised, as a result of the flavor experiments, to use no more than 5 percent of fish meal and to keep feeding oil to 0.15 percent or less for the starting diets.

Fish meal isn't absolutely essential in turkey feed. But it's valued because it furnishes, along with its good protein, an unidentified nutritional factor that's beneficial to the growth of the young birds. ("Agricultural Research," U.S. Dept. of Agr., Washington, D.C.)

## GENETIC IMPROVEMENT THROUGH HYBRIDIZATION

In the north-central, southern, and western regions, 27 agricultural experiment stations are actively engaged in a national project for the improvement of poultry through breeding. Major emphasis is given to studies of the most effective breeding techniques for the improvement of chickens and of factors influencing reproduction in turkeys.

Approximately 100 inbred lines of chickens are under development by stations cooperating in this project. To date, no outstandingly favorable results have been obtained by combinations of inbred lines for broiler production. For egg production, some of the preliminary combinations of inbred lines developed in connection with this project compare favorably with the best commercial hybrids and purebreds. Some new crossbreds with the desired light-colored plumage and superior conformation have been produced at cooperating stations and appear promising for commercial use. One study, concerned with the problem of growth rate in chickens, has shown that where selections have decreased growth rate, a similar decrease took place in egg and body size, indicating an association of these traits.

In crosses involving the same stocks, the three methods of mating ranked in the following order in performance: crossbreeding, strain crossing, and purebreeding. Adult viability seems to be less affected by heterosis than other economic traits of the chicken.

When inbred lines are combined to produce hybrids, there appears to be little difference between the performance of 2-, 3-, and 4-way combinations. The depressing effects of inbreeding on various traits were expressed in the following decreasing order: egg production, hatchability, sexual maturity, and chick viability. When inbred lines are crossed, greatest heterosis is shown in hatchability, chick growth, and egg production. For several traits, the performance of the inbred line itself is the best indication of what the performance of the line will be when combined with other inbred lines. The first 2-way combinations at the Central Testing Station at Purdue University, Lafayette, Ind., made at random among Station inbred lines, produced some hybrids which compared favorably with the best available commercial hybrids. These single crosses were superior to any purebreds under test, indicating the possibility that additional combinations might produce a superior hybrid. (Report of the Chief of the Bureau of Animal Industry (1953), U. S. Department of Agriculture, Washington, D. C.)

## INTERNATIONAL AWARD MADE

The Tom Newman International Award Committee announces that the '1955' Award shall be made to Dr. H. Williams Smith, M.Sc., Dip.Bact. (London), F.R.C.V.S.

The Award is given for the most important contribution to poultry husbandry research work published in the previous year, for the benefit of poultry husbandry.

The Award, instituted in 1948 by Poultry Association of Great Britain, had been won on 5 occasions by U.S.A. research workers and twice by United Kingdom workers.

The Award was made to Dr. H. William Smith primarily for his valuable work on the control of Salmonella infections with particular reference to fowl typhoid. Specific papers arising from his research work carried out during 1954 were:

"Observations on Experimental Fowl Typhoid."—The Journal of Comparative Pathology and Therapeutics.

"The Chemotherapy of Experimental Fowl Typhoid in Fowls (Gallus Domesticus."—The Journal of Comparative Pathology and Therapeutics.

"Food as a Vehicle of Infection: The Effect of variations in the Diet on the Induction of Salmonella Gallinarum Infection."—British Journal of Experimental Pathology. Vol. XXXV, No. 5.

"The Use of Furazolidone in the Treatment of Experimental Fowl Typhoid."—The Veterinary Record.

"The Treatment of Salmonella Pullorum Infection in Chicks with Furazolidone, Sulphamerazine and Chloramphenicol."—The Veterinary Record.

"Experimental Staphylococcal Infection in Chickens."—The Journal of Pathology and Bacteriology. Vol. LXVII No. 1.

"The Pathogenicity and Haemolytic Properties of Staphylococci Isolated from Chickens."—The Journal of Pathology and Bacteriology. Vol. LXVII No. 1.

"Isolation from the Lower Respiratory Tract of Chickens of Bacteria administered by Mouth."—Nature, July 3rd, 1954.

"Serum Levels of Penicillin, Dihydrostreptomycin, Chloramphenicol, Aureomycin and Terramycin in Chickens."—The Journal of Comparative Pathology and Therapeutics.

He became a Member of the Royal College of Veterinary Surgeons in 1941, and secured a London B.Sc. in the same year. Five years later he became an M.Sc. of the University of Wales and was awarded the Ph.D., London, a year later. In 1948 he received a Diploma in Bacteriology, London University. He was elected a Fellow of the Royal College of Veterinary Surgeons in 1953. He became Assistant Veterinary Investigation Officer at the University College of North Wales, Bangor. In 1945 he was awarded a Wellcome Research Fellowship and studied at the London School of Hygiene. In 1949 he was appointed to the Staff of the Animal Health Trust at Houghton Grange, Hunts, where he is engaged on research work in connection with poultry infections.

# REVIEW OF POULTRY PUBLICATIONS

Compiled by J. W. Kinghorne,

1365 Iris St., N.W.

Washington 12, D.C., U.S.A.

## GENETICS

**BLYTH, J. S. S.** (Poultry Res. Center, Edinburgh, Scotland.)
NOTES ON THE POULTRY RESEARCH CENTRE FLOCK OF BROWN LEGHORNS. *World's Poultry Sci. Jour. 10:* 140-143. 1954.—The flock was bred as a closed unit for 20 yrs., and is divided into 8 lines with 25%-80% inbreeding. Avg. annual production by inbred lines ranges from 123 to 214; sexual maturity from 183 to 241 days; adult wt. from 2.7 to 4.6 lbs. and egg wt. from 1.6 to 2.3 oz. Crosses between lines improved viability and production, the latter being due to decreased length of pauses. In small egg strains, egg size of progeny exceeded that of parents.—*J. B. Christiansen.* (Biological Abstracts)

**COCHEZ, L. P.,** and **PERO, R.** 1954. (Sta. Nat. Rech. Avicol., Jouy-en-Josas.)
SELECTION DES CARACTERES ECONOMIQUES — TRANSFORMATION DES MESURES BRUTES EN ECARTS REDUITS POUR ATTENUER L'INCIDENCE DES VARIATIONS DE MILIEU. [SELECTION OF ECONOMIC CHARACTERS: TRANSFORMATION OF RAW DATA INTO STANDARD DEVIATES TO LESSEN THE EFFECT OF ENVIRONMENTAL VARIATIONS.] *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 16-19.—A simplified method of transforming raw data into standard deviates or probits is described and discussed. The method is particularly useful in sib testing and progeny testing when the effects of different hatching dates have to be taken into account. (Animal Breeding Abstracts)

**COLEMAN, T. H.,** and **JAAP, R. G.** 1954. (Ohio State Univ., Columbus.)
THE TOPCROSS PROGENY TESTS OF SIRES USED FOR INBREEDING IN POULTRY. *Poult. Sci., 33:* 958-965.—Prospective epistatic white sires used for further inbreeding were selected on a basis of the growth rate of their cross progeny from random samples of 11 to 18 New Hampshire ♀♀. The cross progeny of one sire (this sire was included in all tests) was used to measure the changes produced with each generation of inbreeding. In 2 generations of selection while increasing the coefficient of inbreeding from 25 to 50%, a gain in weight of 0.11 lb. at 6 wks., 0.23 lb. at 9 wks., and 0.22 lb. at 12 wks. was obtained in the topcross progeny.

When the standard deviation for each of 80 different groups was plotted against body weight at each of 6, 9 and 12 wks. of age, the standard deviation did not increase with increasing weight of the progeny at each specific age. This gave validity to use of the actual deviation for each test in spite of the wide differences in progeny growth rates between tests. Use of the coefficient of variation as a measure of variability in chickens at the same age is questioned.

Some evidence was obtained that 11 ♀♀ are not sufficient to prevent the random selection of an occasional distinctly superior, or inferior, sample of the inheritance for growth rate in a non-inbred population.—*Author's summary.* (Animal Breeding Abstracts)

**DU PLESSIS, P. H. C.** 1954 (Div. Anim. Husb., Pretoria.)
THE MODERN APPROACH TO POULTRY BREEDING. *J. S. Afr. vet. med. Ass., 25 (2):* 1-7. (Animal Breeding Abstracts)

**HENDERSON, E. W.** 1954. (Michigan State Coll., East Lansing.)
THE GENETICS OF A RED LACED WHITE MUTANT CHICKEN. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 5-9.—The red-laced silver mutant was obtained by mating black-laced white (silver-laced) ♂♂ to "red" ♀♀. *(See A.B.A., 21,* No. 954 and *22,* No. 739.) Tentative suggestions are made regarding possible genotypes of this colour pattern. The available evidence suggests either a multiple gene and/or loci colour theory or the "blending" of some pattern genes. "Columbian," silver-pencilled, and silver-laced phenotypes are found in the ancestry of the original red-laced silver ♂ on his sire's side. (Animal Breeding Abstracts)

**JAAP, R. G., GRIMES, J. F., and COLEMAN, T. H.** 1954. (Ohio State Univ., Columbus.)
PUREBREDS, CROSSBREDS AND INCROSSBREDS FOR EGG PRODUCTION IN THE U.S.A. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 42-45.—Eighty-one samples of purebred, crossbred and incrossbred chickens from those produced for sale in the U.S.A. during 1950 to 1953 were tested for comparative mortality, egg production and egg quality. Each year a random sample of 100 pullet chicks from each of the 26 to 28 kinds was started on the same day and reduced to 50 when housed for egg production. An intermingled system of brooding, rearing and laying house management subjected each kind to the same pen and location environment.

Since each of the crossbreds and incrossbreds had either the Rhode Island Red or the White Leghorn as one parent, these 2 breeds were chosen as the purebreds for comparisons. Each year the hen-day egg production of the cross-breds exceeded that of the purebreds, and the incrossbreds laid more eggs than the crossbreds. Averages for the 3 yrs. were purebreds, 44%; crossbreds, 48% and incrossbreds, 51%. It is suggested that the superiority of the incross-breds over the crossbreds may have been due to progeny testing of crosses between inbred lines rather than to any inherent superiority of the incrossbred system of mating.

Mortality in the laying house fluctuated from year to year. When the mortality for the 3 yrs. was averaged (32%), crossbreds and purebreds were identical and the mortality of incrossbreds was slightly greater. Egg weight for the crossbreds was 1 to 2 g. greater than that of the purebreds and incrossbreds. Shell quality was measured by resistance to evaporation. Although the differences were small, shell quality for the incrossbreds was best and the eggs from the purebreds had the poorest shells. The shape of eggs from the purebreds was slightly narrower while the interior quality may have been slightly superior. Differences in shell colour and presence of meat spots could not be attributed to the mating method. (Animal Breeding Abstracts)

**JEROME, F. N.** (Ontario Agric. Coll., Guelph, Canada.)
COLOR INHERITANCE OF GEESE: STUDY 2. *Poultry Sci. 33:* 525-528. Illus. 1954.—The character, neck stripe, was found to result from autosomal genes. Limited data indicate that the pattern types, solid and spotted, result from the action of sex-linked genes. It appears that the adult shades of the Pilgrim breed in which the male is white and the female gray (dilute), result from interaction of sex-linked dilution with the solid pattern of dark gray. The genotypes suggested for this breed are GG SpSp SdSd male G? Sp-Sd-female. It is postulated that 1 gene for sex-linked dilution reduces the dark gray of the female to dilute gray and that the additive effect of the 2 genes for sex-linked dilution reduces the dark gray of the male to white. A mating of Embden male x Pilgrim female produced progeny in which both sexes were white as adults. The proposed genotypes of the cross-bred progeny are GG SpSp SdSd male and G? sp-Sd-female. Limited data indicate gray to be the dominant allele of buff. Further investigation is necessary to determine whether the genes responsible are autosomal or sex-linked. The symbol

(G) is proposed for gray. The original catalogue of characters is brought up to date by incorporating the additional information obtained from this study.—*F. N. Jerome.* (Biological Abstracts)

**KIMBALL, E.** 1954. (Clinton Exp. Farm, Clinton, Conn.)
GENETICS OF JUNGLEFOWL PLUMAGE PATTERNS. *Sec. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 2-5.—Genetic aspects of primary and secondary plumage patterns of wild species of *Gallus* and the origin of plumage patterns in the domestic fowl are reviewed. Cocks of all the wild species except *Gallus varius* differ from the domestic cock in that they are subject to aestival alteration in phenotype (eclipse plumage). The eclipse cycle persists in cocks from matings between wild species but is lost in progeny of crosses with the domestic fowl. Available evidence indicates that the eclipse phase is a result of seasonal physiological feminisation. There is no indication that mutant characters affecting plumage pattern and colour in the domestic fowl are derived from wild species other than *Gallus gallus.* (Animal Breeding Abstracts)

**KING, C.** 1954. (Cornell Univ., Ithaca.)
RANDOM SAMPLE TESTING. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 20-23.—The principles of random sample testing of poultry are outlined, together with the results of the tests completed to date in California and New York. (Animal Breeding Abstracts)

**LETARD, E.,** and **SZUMOWSKI,** P. 1954. (Ec. Nat. Vét., Alfort.)
AU SUJET DE L'HYBRIDATION DITE "VEGETATIVE" CHEZ LES VOLAILLES. [ON SO-CALLED "VEGETATIVE" HYBRIDISATION IN POULTRY.] *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 86-88.—The meaning of the term "vegetative hybridisation" is discussed, with examples of some of the methods by which it has been carried out in animals. In view of the claim made by Soviet workers that changes in the plumage colour of the offspring have been brought about by the transfer of albumen from eggs of one breed of fowl to those of another, the authors repeated the Soviet experiment using eggs of 5 breeds which show distinct plumage differences—Sussex, Coucou de Malines, Bresse Noir, White Leghorn, and Rhode Island Red. From 90 eggs in which albumen exchanges (2-14 ml.) were carried out, 16 live chicks were hatched; 20 embryos developed to full term but did not hatch. In no case was the colour of the plumage, beak or tarsus different from that found in purebred chicks. Leghorn×R.I.R. "hybrids" which were reared to 9 mths. of age likewise did not differ appreciably from purebred birds. The shade variations observed in the red colour of R.I.R. cocks from eggs injected with Leghorn albumen were such as are normally found among purebred birds. The vegetative hybrids did, however, show a greater gain in weight during the 1st week. The differences in weight between experimental birds and controls at a later age were insignificant. (Animal Breeding Abstracts)

**MARTIN, J. H.,** and **BELL, A. E.** 1954. (Purdue Univ., Lafayette.)
NEW APPROACHES IN POULTRY BREEDING. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], *1954: 28-30.*—A review, dealing mainly with the problem of plateaux in performance, the population genetics approach to poultry improvement, breeding for heterosis, and pilot testing of new ideas and concepts in quantitative genetics. (Animal Breeding Abstracts)

**MEHNER, A., SCHERRBACHER, H.,** and **HARMS, T.** 1954. (Landw. Hochsch., Hohenheim/Württemberg.)
TESTING THE HEREDITARY VALUE OF COCKS PRIOR TO THEIR USE FOR BREEDING. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], *1954: 49-54.*—A method is described whereby cocks can be tested before being used for breeding in their 2nd yr. of life. The evaluation is based on the relationship between part winter performance (eggs laid between 1st Oct. and 31st Dec.) or total winter performance (eggs laid between 1st Oct. and 28th Feb.) of the cock's daughters and their total year's performance. The av. performance of a hen's progeny was

compared, not with their dam's performance, but with the mean of the dam's full sisters.

The coefficient of correlation between total winter performance and year's performance was 0.744±0.016; that between part winter performance and year's performance was 0.680±0.019. Both coefficients were highly significant. The method of partial winter performance was not accurate enough for calculating individual performances but gave very satisfactory results when large numbers of birds were used. Although the selection of sires based on the total winter performance of their daughters was 20% safer than that based on part winter performances, the latter was sufficiently accurate to prevent the admission of an inferior cock to the flock or the exclusion of a good cock. It also allowed a cock to be admitted to the flock in time for a very early hatching season. The practical application of this method of testing cocks is discussed. (Animal Breeding Abstracts)

**MERAT, P., BOYER, J. P.,** and **PERO, R.** 1954. (Sta. Nat. Rech. Avicol., Jouy-en-Josas.)

LA SELECTION DES CARACTERES ECONOMIQUES CHEZ LA VOLAILLE. [SELECTION OF ECONOMIC CHARACTERS IN POULTRY.] *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 24-27.—A critical study is made of the degree of accuracy of various measurements and of the estimation of parameters useful in selection. A number of criteria for the selection of economic characters are proposed, as well as elements of a method of selection based on actual population data. (Animal Breeding Abstracts)

**MILNE, T.** 1954. (Kellas Poult. Farm, Dundee.)

SEVEN YEARS PEDIGREE BREEDING FOR EGG PRODUCTION ON A SMALL SCOTTISH FARM. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 54-56.—The methods and results of selection in a flock of not more than 500 R.I.R.'s are described. There appears to be an association between early hatching in the chick and early maturity and fast rhythm of laying in the adult. Among chicks that hatch very late there is often a preponderance of ♂♂. (Animal Breeding Abstracts)

**MORRISON, J., HALE, R. W.,** and **COEY, W. E.** 1954.

POULTRY BREEDING. *27th Rep. agric. Res. Inst. N. Ire.*, 1953-54: 19-20.—Results are tabulated of the 1st year's breeding in the new White Wyandotte flock at the Agricultural Research Institute, Hillsborough, Co. Down, for pullets hatched in 1952 (500-day performance) compared with the 1951 flock which was bred from unrecorded stock. The reduction in single-comb chicks hatched, from 7.2 to 5.1% in 1952, is a definite genetic improvement and the reduction in percentage of pullets which showed broodiness from 41 to 29 is a probable genetic effect. Hen-housed av. production to 500 days was 182 eggs in 1952 *v.* 170 in 1951. Average egg weight was 2.31 oz. and 2.28 oz. resp. (Animal Breeding Abstracts)

**OANA, H.** 1954.

ON THE ORIGIN OF THE JAPANESE LONG-TAILED FOWLS. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 9-12.—There are 11 varieties or breeds of long-tailed fowls in Japan, the oldest breed being the Shokoku. The history and characteristics of this moderately long-tailed, long-crowing fowl are discussed. It is believed that it was originally imported from the Changkuo district in Ningpo-fu, China, between 794 and 1186 for cock fighting at the Japanese court. The ♂ weighs 4-5 lb. and the ♀ 3-4 lb. During World War II the breed practically died out, and only a few birds now remain.

One of the breeds which has been derived from the Shokoku by mutation and selection is the Onaga-Dori (Yokohama, Phoenix). The form and arrangement of the tail feathers of the ♂ Onaga are of the Shokoku type, but their length is very much greater. Birds with tails up to 24 ft. long have been reported. About half of the tail feathers moult yearly, while the remainder (about 20) grow longer at the rate of about 3 ft. a year without moult. The saddle feathers (150-200 in number) grow at the rate of approx. 1 ft. a year without moult. The present stock in Ohshino village, the home of the breed, is about 20 ♂♂ and 20 ♀♀

(G) is proposed for gray. The original catalogue of characters is brought up to date by incorporating the additional information obtained from this study.—*F. N. Jerome.* (Biological Abstracts)

**KIMBALL, E.** 1954. (Clinton Exp. Farm, Clinton, Conn.)
GENETICS OF JUNGLEFOWL PLUMAGE PATTERNS. *Sec. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 2-5.—Genetic aspects of primary and secondary plumage patterns of wild species of *Gallus* and the origin of plumage patterns in the domestic fowl are reviewed. Cocks of all the wild species except *Gallus varius* differ from the domestic cock in that they are subject to aestival alteration in phenotype (eclipse plumage). The eclipse cycle persists in cocks from matings between wild species but is lost in progeny of crosses with the domestic fowl. Available evidence indicates that the eclipse phase is a result of seasonal physiological feminisation. There is no indication that mutant characters affecting plumage pattern and colour in the domestic fowl are derived from wild species other than *Gallus gallus.* (Animal Breeding Abstracts)

**KING, C.** 1954. (Cornell Univ., Ithaca.)
RANDOM SAMPLE TESTING. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 20-23.—The principles of random sample testing of poultry are outlined, together with the results of the tests completed to date in California and New York. (Animal Breeding Abstracts)

**LETARD, E., and SZUMOWSKI, P.** 1954. (Ec. Nat. Vét., Alfort.)
AU SUJET DE L'HYBRIDATION DITE "VEGETATIVE" CHEZ LES VOLAILLES. [ON SO-CALLED "VEGETATIVE" HYBRIDISATION IN POULTRY.] *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 86-88.—The meaning of the term "vegetative hybridisation" is discussed, with examples of some of the methods by which it has been carried out in animals. In view of the claim made by Soviet workers that changes in the plumage colour of the offspring have been brought about by the transfer of albumen from eggs of one breed of fowl to those of another, the authors repeated the Soviet experiment using eggs of 5 breeds which show distinct plumage differences—Sussex, Coucou de Malines, Bresse Noir, White Leghorn, and Rhode Island Red. From 90 eggs in which albumen exchanges (2-14 ml.) were carried out, 16 live chicks were hatched; 20 embryos developed to full term but did not hatch. In no case was the colour of the plumage, beak or tarsus different from that found in purebred chicks. Leghorn×R.I.R. "hybrids" which were reared to 9 mths. of age likewise did not differ appreciably from purebred birds. The shade variations observed in the red colour of R.I.R. cocks from eggs injected with Leghorn albumen were such as are normally found among purebred birds. The vegetative hybrids did, however, show a greater gain in weight during the 1st week. The differences in weight between experimental birds and controls at a later age were insignificant. (Animal Breeding Abstracts)

**MARTIN, J. H., and BELL, A. E.** 1954. (Purdue Univ., Lafayette.)
NEW APPROACHES IN POULTRY BREEDING. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], *1954: 28-30.*—A review, dealing mainly with the problem of plateaux in performance, the population genetics approach to poultry improvement, breeding for heterosis, and pilot testing of new ideas and concepts in quantitative genetics. (Animal Breeding Abstracts)

**MEHNER, A., SCHERRBACHER, H., and HARMS, T.** 1954. (Landw. Hochsch., Hohenheim/Württemberg.)
TESTING THE HEREDITARY VALUE OF COCKS PRIOR TO THEIR USE FOR BREEDING. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], *1954: 49-54.*—A method is described whereby cocks can be tested before being used for breeding in their 2nd yr. of life. The evaluation is based on the relationship between part winter performance (eggs laid between 1st Oct. and 31st Dec.) or total winter performance (eggs laid between 1st Oct. and 28th Feb.) of the cock's daughters and their total year's performance. The av. performance of a hen's progeny was

compared, not with their dam's performance, but with the mean of the dam's full sisters.

The coefficient of correlation between total winter performance and year's performance was 0.744±0.016; that between part winter performance and year's performance was 0.680±0.019. Both coefficients were highly significant. The method of partial winter performance was not accurate enough for calculating individual performances but gave very satisfactory results when large numbers of birds were used. Although the selection of sires based on the total winter performance of their daughters was 20% safer than that based on part winter performances, the latter was sufficiently accurate to prevent the admission of an inferior cock to the flock or the exclusion of a good cock. It also allowed a cock to be admitted to the flock in time for a very early hatching season. The practical application of this method of testing cocks is discussed. (Animal Breeding Abstracts)

**MERAT, P., BOYER, J. P.,** and **PERO, R.** 1954. (Sta. Nat. Rech. Avicol., Jouy-en-Josas.)

LA SELECTION DES CARACTERES ECONOMIQUES CHEZ LA VOLAILLE. [SELECTION OF ECONOMIC CHARACTERS IN POULTRY.] *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 24-27.—A critical study is made of the degree of accuracy of various measurements and of the estimation of parameters useful in selection. A number of criteria for the selection of economic characters are proposed, as well as elements of a method of selection based on actual population data. (Animal Breeding Abstracts)

**MILNE, T.** 1954. (Kellas Poult. Farm, Dundee.)

SEVEN YEARS PEDIGREE BREEDING FOR EGG PRODUCTION ON A SMALL SCOTTISH FARM. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 54-56.—The methods and results of selection in a flock of not more than 500 R.I.R.'s are described. There appears to be an association between early hatching in the chick and early maturity and fast rhythm of laying in the adult. Among chicks that hatch very late there is often a preponderance of ♂ ♂. (Animal Breeding Abstracts)

**MORRISON, J., HALE, R. W.,** and **COEY, W. E.** 1954.

POULTRY BREEDING. *27th Rep. agric. Res. Inst. N. Ire.*, 1953-54: 19-20.—Results are tabulated of the 1st year's breeding in the new White Wyandotte flock at the Agricultural Research Institute, Hillsborough, Co. Down, for pullets hatched in 1952 (500-day performance) compared with the 1951 flock which was bred from unrecorded stock. The reduction in single-comb chicks hatched, from 7.2 to 5.1% in 1952, is a definite genetic improvement and the reduction in percentage of pullets which showed broodiness from 41 to 29 is a probable genetic effect. Hen-housed av. production to 500 days was 182 eggs in 1952 *v.* 170 in 1951. Average egg weight was 2.31 oz. and 2.28 oz. resp. (Animal Breeding Abstracts)

**OANA, H.** 1954.

ON THE ORIGIN OF THE JAPANESE LONG-TAILED FOWLS. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 9-12.—There are 11 varieties or breeds of long-tailed fowls in Japan, the oldest breed being the Shokoku. The history and characteristics of this moderately long-tailed, long-crowing fowl are discussed. It is believed that it was originally imported from the Changkuo district in Ningpo-fu, China, between 794 and 1186 for cock fighting at the Japanese court. The ♂ weighs 4-5 lb. and the ♀ 3-4 lb. During World War II the breed practically died out, and only a few birds now remain.

One of the breeds which has been derived from the Shokoku by mutation and selection is the Onaga-Dori (Yokohama, Phoenix). The form and arrangement of the tail feathers of the ♂ Onaga are of the Shokoku type, but their length is very much greater. Birds with tails up to 24 ft. long have been reported. About half of the tail feathers moult yearly, while the remainder (about 20) grow longer at the rate of about 3 ft. a year without moult. The saddle feathers (150-200 in number) grow at the rate of approx. 1 ft. a year without moult. The present stock in Ohshino village, the home of the breed, is about 20 ♂ ♂ and 20 ♀ ♀

of the Shirafuyi type and about 10 ♂♂ and 10 ♀♀ of the white type.

The other breeds of Japanese long-tailed fowl are the Tohtenko, Ohiki, Kuro-kashiwa, Tohmaru, Minohiki, Satsuma, Hanto, Koeyoshi, and Jitokko. The area of production and the main characteristics of these breeds are very briefly indicated. All have tail feathers of the Shokoku type. (Animal Breeding Abstracts)

**ONISHI, N.** 1954. (Nat. Inst. Agric. Sci., Chiba.)

ON THE INHERITANCE OF SEXUAL MATURITY IN SINGLE COMB WHITE LEGHORNS. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 30-33.—Sexual maturity (age at first egg) was found to have a fairly low degree of heritability in a flock of S.C. White Leghorns consisting of several families of different inbred strains and some crosses between them. In 1949 heritability was estimated to be 0.09; in 1951 it was estimated at 0.23, a figure similar to that obtained by other workers from non-inbred populations.

Inbreeding increased the mean age at 1st egg and the variability in the character could not easily be decreased in spite of the intensity of inbreeding. Sexual maturity was earlier in crossbred birds, and its variability was significantly smaller than in the parental inbreds. An observed tendency to patroclinous inheritance of sexual maturity in crosses between early- and late-maturing birds suggests that sex-linked genes may be involved, although the difference between reciprocal crosses was not statistically significant. (Animal Breeding Abstracts)

**OSBORNE, R.** 1954. (Poult. Res. Centre, Edinburgh.)

INHERITANCE STUDIES ON EGG WEIGHT IN THE DOMESTIC FOWL. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 33-37.—Analysis of variance of 9 yearly samples of mean March egg weight in a line of Brown Leghorns reveals the uniform predominance of variation due to the ♂ parent. Similar results are observable from at least 3 other sources. In contrast a major difference between 2 lines appears to be autosomally inherited, as indicated by results of reciprocal crosses. Either type of variation may of course be dependent on the relative importance of other characteristics to between-and within-line variation.

Analysis of total egg weight and weight of albumen, yolk and shell has been made for 2 samples. A discrepancy between them suggests firstly that the pattern of sex-linkage may be the result of genetic reaction to a particular environment, the evidence of sex-linkage being less in birds subject to artificial lighting. Secondly the genetic variation of total weight and albumen possibly follows the pattern set originally in yolk.

An interesting example of the ambiguity of isolated variance components is given in the case of the shell. A component suggesting maternal effects or dominance deviations may in fact be due to a type of epistasis. The response in shell weight to large genetic increments in egg weight appears to be proportionally less than that found for small changes. (Animal Breeding Abstracts)

**PEASE, M., and DUDLEY, F.** 1954. (Northern Poult. Breed. Sta., Reaseheath, Cheshire.)

HYBRID VIGOUR IN POULTRY. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 45-49.—Five lines of White Leghorns have been bred at Reaseheath, Cheshire, England, by continued brother/sister mating, starting at various dates between 1933 and 1940. An experiment was begun in 1944 to find out the effect of heterosis on 6 measurable characters in each of the 20 possible incrosses from these 5 lines. The 6 characters measured were (1) age at sexual maturity, (2) weight at sexual maturity, (3) number of eggs laid in 44 wks. from date of 1st egg, (4) body weight at the end of the test period, (5) av. egg weight, and (6) mortality.

The comparisons were not with the inbred parent lines, but with pullets from a stock of W.L.s bred at Reaseheath so as to be as heterozygous as possible; in each case comparison was between incross pullets and outcrossed pullets hatched at the same time. The object of the experiment was to test whether there is any substance in the claim that

preliminary inbreeding increases the heterosis effect, either generally or specifically in certain incrosses.

In sexual maturity, body weight, and egg weight the incrosses almost all fell behind the corresponding control stock. But in viability and egg production many of the incrosses proved superior to the controls. Six incrosses had significantly lower mortality than the controls, none had significantly higher viability and in 14 incrosses the differences were insignificant. In the case of egg production, 12 incrosses laid better (5 substantially) than the controls and 7 showed no significant differences, and one laid significantly worse than the control. The experiment did not reveal any clue by which the performance of an incross could be predicted. (Animal Breeding Abstracts)

**POIRIER, R. P.** 1954. (Inst. Oka, Univ. Montreal, LaTrappe, P.Q.)
GENETIC ASPECTS OF THE RESISTANCE TO A LYMPHOMATOSIS TUMOR IN THE FOWL. *Contr. Inst. Oka*, No. 9: 48 pp.—A total of 1996 randomly selected birds of 6 breeds was inoculated with tumorous emulsion; 36% survived. There was a statistically significant difference between breeds and families, survival percentage being highest in New Hampshires with 50%, followed by Black Minorcas (45.2%) R.I.R.s (35.5%), W.L.s (33.0%), White Plymouth Rocks (25.9%), and White Minorcas (21.7%). Birds of the 2nd generation from families selected for resistance had a survival rate to inoculation of 60.2%; of the 3 breeds represented resistance was greatest in New Hampshires (78.6%), and greater in W.L.s (60.8%) than in White Plymouth Rocks (55.5%). Heritability for the family percentages of survival was estimated as being 25.8%. Survival rate after inoculation was 23.9% for 2nd generation birds from those selected for susceptibilty. In the 3rd generation survival rate was 61.3% for the resistant, and 40.0% for the susceptible group; the latter was not appreciably different from the 34% survival of the uninoculated controls. No sex differences were observed in survival percentage. Variations due to increased virulence of the inoculum were also studied. (Animal Breeding Abstracts)

**PONSIGNON, M.** 1954. (Elev. Roseraie, Chamesson.)
ESSAI D'AMELIORATION DES FACULTES DE FECONDATION ET D'ECLOSION D'UNE LIGNEE DE PONDEUSES PAR LE CONTROLE GENETIQUE. [ATTEMPT TO IMPROVE FERTILITY AND HATCHABILITY IN A STRAIN OF LAYERS BY GENETIC CONTROL.] *Sec. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 56-59.—A tentative plan is suggested for the elimination of lethal genes from breeding stock by test matings over several years and by inbreeding. (Animal Breeding Abstracts)

**PUN, C. F.** (U. California, Davis.)
THE CROOKED NECK DWARF LETHAL SYNDRONE IN THE DOMESTIC FOWL. *Jour. Exptl. Zool.* 126: 101-133. Illus. 1954.—The crooked neck dwarf lethal in the New Hampshire breed of domestic fowl is an autosomal recessive which, in addition to causing gross abnormalities of the skeleton, interferes with normal muscular development; the muscle is histologically abnormal. Further study revealed that the gene causes esophageal atresia which prevents amniotic fluid from reaching the digestive tract as indicated by hydramnios, empty proventriculus and gizzard, excessive bile in the digestive tract, and increased N content of the amniotic fluid after the 12th day of incubation. The hypothesis is advanced that lethal embryos suffer from chronic starvation because of their inability to swallow the amniotic fluid. Similarities in the changes from the normal, of the lethal and its organs, to those of starved chicks and rats support the hypothesis which accounts for the following changes in the lethal embryos: (1) greatly retarded growth after 14 days; (2) edema and hydration; (3) deficiency of K at the 18th day of incubation in embryos and yolks; (4) relative hypertrophy of the adrenals with greater than normal accumulations of large fat droplets in the cortical cells and indicating overactivity as a response to the stress of starvation. —*Auth.* (courtesy Wistar Bibl. Serv.).

**ROSENBERG, M. M., ALICATA, J. E., and PALAFOX, A. L.** 1954. (Hawaii Agric. Exp. Sta., Honolulu.)
FURTHER EVIDENCE OF HEREDITARY RESISTANCE AND SUSCEPTIBILITY TO CECAL COCCIDIOSIS IN CHICKENS. *Poult. Sci.*, 33: 972-980.—From an original mating of a single S.C. White Leghorn ♂ and 14 S.C. White Leghorn ♀♀ selected at random, it was possible to develop and establish 2 lines that differed significantly in resistance to the protozoan disease, *Eimeria tenella*. The av. difference between the 2 lines in survivability of chicks artifically challenged with a controlled dose of sporulated oocysts was, for each of the last 3 yrs. of the experiment, 39.1, 40.0 and 43.1% resp. The comparative resistance of the susceptible line was 50.9% that of the resistant line in the last generation.

The factor or factors for resistance or susceptibility do not exhibit a strong order of dominance; rather, the segregation in degree of resistance exhibited by the reciprocal crosses between the resistant and susceptible lines and from backcross matings of $F_1$ dams to resistant and susceptible line sires suggests a lack of dominance of gene action, particularly if the number of factors involved is small. Furthermore, these data do not support the possible effect of sex-linkage, passive transfer of immunity, or cytoplasmic inheritance. (Animal Breeding Abstracts)

**SASAKI, K.** 1954. (Fac. Agric., Univ. Tokyo.)
PRECIPITATION TEST FOR A GENERIC HYBRID IN POULTRY. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 91-93.—The hybrid between the pheasant (*Phasianus colchicus karpowi* Buturlin) hen and the game (*Gallus domesticus* Brisson) cock does not possess in its blood serum any species-specific protein component which is not present in the serum of the parental species. (Animal Breeding Abstracts)

**SCOSSIROLI, R. E., and MERIGGI, M.** 1954. (Ist. Genet., Univ. Pavia, and Allev. Avic. "La Maestà," Pavia.)
L'IMPIEGO DEGLI IBRIDI NELLA PRODUZIONE DEI POLLI DA CARNE. [THE USE OF CROSSES IN THE PRODUCTION OF CHICKENS FOR MEAT.] *Riv. Zootec., 27:* 266-269.—The live weight at 60 days of 88 White Leghorn×R.I.R. ♀♀ was on the average 107.2 g. greater than that of 119 R.I.R. purebred ♀♀; the corresponding difference between 78 ♂ crossbreds and 113 ♂ purebreds was 101.3 g. in favour of the crossbreds. Adult live weights, however, were lower in the crosses than in the R.I.R. purebreds. Age at 1st egg was 196-202 days in W.L.s, 239-277 days in R.I.R.s and 225-228 days in the crosses. (Animal Breeding Abstracts)

**SKALLER, F.** 1954. (Poult. Res. Centre, Werribee, Vict.)
HETEROSIS FROM CRISS-CROSS BREEDING IN POULTRY. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 59-64.—A comparison was made over a 4-yr. period between the performance (fertility and hatchability, chick mortality, sexual maturity, body weight) of randomly selected purebred S.C. White Leghorns and Black Australorps, single crosses between these breeds, and crisscrossbreds. From the 4th generation onwards the crisscrossbred population had an av. genotype representing 2/3 of the sire's breed and 1/3 of the maternal grandsire's breed.

In hatchability the single crosses were superior to the purebreds, and, with the exception of dams mated to one particular sire, the crisscrosses showed the same good hatchability as the single crosses. Fertility percentages were higher for the crisscross dams than for dams of the other 2 groups. Chick mortality was lower in both types of crosses than in the purebreds. Sexual maturity was only slightly better in the crosses than in purebred W.L.s but was nearly 2 wks. earlier than in purebred Australorps. The limited data on housing weight indicate that both crisscrossbreds and single crosses are heavier than W.L.s but slightly lighter than Australorps. Both types of crosses produced significantly more eggs than the purebreds in each of the years under review. Crisscross breeding for 4 generations did not reduce the heterosis effect on egg production. In adult mortality rate the crosses did not differ significantly from the purebreds.

In commercial breeding the system of crisscrossing has the advantage that, with the exception of the sires, the whole flock can consist of crossbreds only. (Animal Breeding Abstracts)

**TAIBEL, A. M.** 1954. (Exp. Poult. Breed. Sta., Rovigo.)
A GROUP OF PLUMAGE FACTORS IN THE MUSCOVY DUCK [CAIRINA MOSCHATA DOMESTICA L.]. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 12-13.—Experimental matings were made between birds with different plumage characters, viz. black×white, black ×barred, white×barred, and between the progeny of each cross. The results indicate that the autosomal factor determining the presence of pigmentation is incompletely dominant to that inhibiting pigmentation, and that self black is dominant to barring. In the Muscovy duck it has now been possible to demonstrate 3 possible types of albinos. (Animal Breeding Abstracts)

**URI, D.** 1954.
A SCHEME FOR CONTROLLING BREEDING FLOCKS IN ISRAEL. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 323-324. —Details are given of the laying standards required before a poultry farm is approved by the Poultry Breeders' Association of Israel for the production of breeding stock. Twelve selected farms are engaged in rearing pedigree stock which is used for improving the flocks on the breeding farms. As a result of the control of birds on the breeding farms, egg production per 100 hens housed on these farms rose from 9630 in 1938 to 13,500 in 1952. Losses from death and culling fell from 20.4 to 13.4%. (Animal Breeding Abstracts)

**VAN GINK, C. S.** Th. 1954.
THE IMPORTANCE OF FURTHER INVESTIGATIONS INTO THE ORIGIN OF THE DOMESTIC FOWL. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 1-2.—The fact that fertile crosses are possible between the 4 wild breeds of fowl still existing, and between each of the wild breeds and the domestict fowl, is strong evidence for the correctness of the assumption that the domesticated breeds are not descended exclusively from *Gallus bankiva*. The 4 wild breeds existing at present, although differing from each other in colour, pattern, type of feathering, head furnishings and colour of legs, do not produce crosses which show the sort of variation that would account for the fundamental differences between the wild breeds and large domesticated fowls such as the Asiatic and Malayoid breeds. It seems likely, therefore, that at least one, but more probably 2 other wild breeds of fowl have existed from which the large Asiatic and Malayoid breeds are derived. A comparison is made between the Aseel, the purest breed of the Malayoid group, and the ordinary *bankiva* fowl. (Animal Breeding Abstracts)

**WATERS, N. F. 1954.** (Reg. Poult. Res. Lab., East Lansing, Mich.)
AVIAN LYMPHOMATOSIS MORTALITY AMONG INBRED LINE CROSSES. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 201-205.—Between-year fluctuations in both visceral and neural lymphomatosis were found among the different inbred lines. From the limited data available no conclusions were possible as to the mode of inheritance of resistance to neural lymphomatosis. In the case of visceral lymphomatosis, the available data indicate that the crossing of resistant and susceptible inbred lines imparts no high degree of resistance to the progeny. With few exceptions, mortality among the single cross, backcross and 4-way cross progeny was equal to, or greater than, that found in the most susceptible inbred line. (Animal Breeding Abstracts)

**WOLFF, D.** 1954.
TEAM WORK AS A PRINCIPLE OF A NEW SWISS POULTRY BREEDING SCHEME. *Sect. Pap. 10th World's Poult. Congr* [*Edinb.*], 1954: 326-328.—The new simplified poultry scheme was inaugurated by a group of 4 poultry breeders and was later taken up by the Association of Swiss Poultry Farmers. The scheme is outlined. Instead of the individual bird, the family of full sisters is taken into account in selecting breeding stock. The performance of the family (based on limited trap-

nesting, is compared with that of the whole population, and even a hen of very high performance is rejected if the family of full sisters does not show records above the average. The breeding aims are egg production, vitality, hatching results, body weight and egg weight; general appearance does not count. (Animal Breeding Abstracts)

**WYATT, A. J.** 1953. (Iowa Agric. Exp. Sta., Ames.)
GENETIC COVARIATION OF EGG PRODUCTION AND OTHER ECONOMIC TRAITS IN POULTRY. *Doct. Thesis No. 1412, Iowa State Coll., Ames.* From abstract in *Iowa St. Coll. J. Sci.*, 1954, *28:* 421-422.—A study was made of egg weight, egg production rate, and body weight at 8 wks., at the time of housing, and in March, in 1960 pullets of 9 breeds over a 5-yr. period. Housing weights were corrected to a constant age. Preliminary analyses indicated that date of hatch had little influence on the above traits. Estimates of heritability, based on regressions of daughter on dam and adjusted for an av. inbreeding of 19%; were as follows: egg weight, 0.52; production rate, 1st Dec-1st March, 0.11; 2nd March-31st May, 0.0; first egg to 31st May, 0.0; body weight at 8 wks., 0.39; housing weight, 0.18; March body weight, 0.52. Negative genetic correlations were found between winter rate and egg weight (—0.43) and between winter rate and March body weight (—0.31). Estimates of genetic correlation among the body weights were all positive and high. There was a correlation of 0.30 between egg weight and March body weight. (Animal Breeding Abstracts)

## PHYSIOLOGY

**ATTARDI, G.**
LA COLTIVAZIONE IN VITRO DI CELLULE FISSE CORNEALI DI EMBRIONI DI POLLO. [CELL CULTURE OF THE CORNEA CHICK EMBRYOS.] *Arch. Ital. Anat. e Embriol. 59:* 38-56. Illus. 1954.—The corneas of 10-13 days chick embryos were cultivated by the hanging drop method in a mixture of plasma and embryo extract and transplanted every 2-3 days. Inside the explant, dedifferentiation of the fixed cells took place slowly, but progressively. After 6-7 transfers all the cells were dedifferentiated. Cells which migrated outside the explant were after 8-10 days still of the differentiated type; only after 3-4 subcultures dedifferentiated cells with short and broad processes predominate. It appears that the main factor determining the specific shape of the corneal fixed cells is the relation with a fibrous stroma which has a characteristic structure. Cells getting free in cultures undergo a more or less rapid dedifferentiation, whereas those remaining inside the explant loose their specific shape much more slowly in connection with the progressive structural changes of the stroma.—*Auth. abst.* (Biological Astracts)

**AXELSSON, J.** 1954. (Inst. Anim. Nutr., Roy. Agric. Coll. Sweden, Uppsala.)
INFLUENCE OF SIZE OF EGGS ON GROWTH RATE OF EMBRYOS AND CHICKS. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 65-66.—The 2027 eggs used in this study were from R.I.R. ♀♀ mated with W.L. ♂♂. The number of chicks which reached 6 wks. of age was 1908. The weight of the hatched eggs was found to be closely correlated with the weight of the baby chicks ($r$=0.867) and less closely correlated with the weight of the chicks at 6 wks. of age ($r$=0.148 for cockerels, $r$=0.195 for pullets.) A positive correlation also existed between the weight of baby chicks and their weight at 6 wks. ($r$=0.184 for cockerels, $r$=0.250 for pullets).

The correlations between egg weight and body weight at 140 days and at sexual maturity (av. age 159 days) were calculated in the case of 223 pullets. The influence of egg weight on body weight ($r$=0.124 was still apparent at 140 days as well as at sexual maturity ($r$=0.144), although the correlation coefficients were too small to be fully significant. There was, however, a significant correlation ($r$=0.241) between the weight of the hatched eggs and the weight of the first-laid eggs. Be-

tween body weight at sexual maturity and weight of the 5 first-laid eggs the relationship was also rather close ($r$=0.497). (Animal Breeding Abstracts)

**BISWAL, G.** 1954 (U. Illinois, Urbana)
ADDITIONAL HISTOLOGICAL FINDINGS IN THE CHICKEN REPRODUCTIVE TRACT. *Poultry Sci. 33:* 843-850. Illus. 1954.—A histologic study of the reproductive tract of 19 apparently healthy White Plymouth Rock laying pullets revealed the following features in addition to histologic structures previously described. The ovarian stroma contained chromaffin cells, an epoöphoron, sympathetic ganglion cells, hyaline bodies, plasma cells, extravascular erythrocytes, macrophages, and extrafollicular yolk spheres of varying size. Scattered lymphocytes were present in the cortex, medulla, ganglia, nerve trunk and in the interstices of the ovarian stroma. The left adrenal gland appeared to be partially embedded in the ovarian tissue. Scattered plasma cells, lymphocytes and lymphocytic aggregates were seen in all five segments of the oviduct. Ganglion cells which were regarded by the author as parasympathetic were seen in the vagina only.—*C. C. Morrill.* (Biological Abstracts)

**BRUCE, H. M., R. PITT RIVERS,** and **H. A. SLOVITER.** (Natl. Inst. Med. Res., London, N.W. 7.)
A NOTE ON THE EFFECT OF TRIIODOTHYROACETIC ACID ON THE PLUMAGE OF BIRDS MADE THYROID DEFICIENT BY TREATMENT WITH 131I. *Jour. Endocrinol. 10:* 340-341. 1954—Adult Brown Leghorns, thyroid deficient after treatment with radioactive I (5 mc 131I/bird following a preparatory feeding period on an I deficient regime) were used to test the thyroid replacement activity of triiodothyroacetic acid, the acetic acid analogue of triiodothyronine. Plumage changes characteristic of thyroxine administration were brought about by triiodothyroacetic acid (total dose 9 mg in N.S.S. spread over 5 days—intramuscular injection). The effect was transient, subsequent feather growth produced thyroid deficient plumage.—*H. M. Bruce.* (Biological Asbtracts)

**COLE, R. K.,** and **HUTT, F. B.** 1954. (Cornell Univ. Agric. Exp. Sta., Ithaca.)
THE EFFECT OF DUBBING ON EGG PRODUCTION AND VIABILITY. *Poult. Sci., 33:* 966-972.—Average number of eggs laid per bird up to 500 days of age was 185 in 2717 White Leghorn pullets dubbed at 8 wks. *v.* 182 in 2768 non-dubbed controls. The difference was not statistically significant. It is suggested that the dubbed ♀♀ showed higher av. production because they included fewer birds with abnormally low records. Dubbing had no effect upon viability to 500 days of age, on body weight or on age at sexual maturity. (Animal Breeding Abstracts)

**COWEN, P. N.** (Poultry Res. Centre, Edinburgh.)
IMPERFECT FUSION OF THE STERNUM IN A CHICKEN AND A DUCK. *Brit. Vet. Jour. 110:* 26-29. Illus. 1954.—A Brown Leghorn male of the Center stock was found to lack a keel and the 2 lateral sternal elements had failed to fuse. A comparable condition was found in a duck.—*K. L. Bullis.* (Biological Abstracts)

**CZARNECKA, J.** 1954.
CIEZAR JAJ I ICH ZDOLNOSC WYLEGOWA. [EGG WEIGHT IN RELATION TO HATCHABILITY.] *Przgl. hodowl., 22* (2): 40-44.—Investigations were carried out at the Racota Poultry Farm on the relationship between egg weight and hatchability. Contrary to expectation, good hatchability results (74.8%) were obtained in the case of large eggs weighing over 65 g., although best results (81.1%) were obtained with eggs weighing 60.1-65 g. The smallest eggs (weighing 54-56 g.) gave the poorest hatchability (53.0%). The hatchability of large eggs may be low if they come from hens that normally lay small eggs and are thus possibly defective. Large eggs laid by hens that habitually lay large eggs hatch very well and there is no reason why they should not be used for incubation. (Animal Breeding Abstracts)

**DURAISWAMI, P. K.**
EXPERIMENTAL TERATOGENESIS WITH BENZYL ALCOHOL. *Bull. Johns Hopkins Hosp. 95:* 57-67. Illus. 1954.—A preliminary report of the production of meningoceles, limb deformities and beak defects in chicks following injection of 0.01-0.02 cc of benzyl alchol into the yolks of fertile eggs either before incubation or sometime in the 1st week after beginning of incubation.—*E. K. Stoner.* (Biological Abstracts)

**EDWARDS, WILLIAM H.,** and **WILBOR O. WILSON.** (U. California, Davis.)
RELATION OF HYPERTHERMY TO NITROGEN EXCRETION IN CHICKENS. *Amer. Jour. Physiol. 179:* 76-78. 1954.—The effect of hyperthermy in White Leghorn laying hens upon certain nitrogenous constituents of the blood and urine was studied. A rise in body temperature of 5°F was found to be accompanied by a reduction in the percentage of non-protein N as uric acid N in the urine. The blood was altered as follows: Uric acid nitrogen as well as the percentage of the non-protein N as uric acid nitrogen was decreased by hyperthermy. On the other hand, purine N and percentage non-protein N as purine N was greatly increased.—*W. O. Wilson.* (Biological Abstracts)

**FRANTZ, WILLIAM L.** (Ohio State U., Columbus.)
SOME EFFECTS OF HYPOPHYSECTOMY ON THE DOMESTIC HEN. *Ohio Jour. Sci. 54:* 335-341. Illus. 1954.—Descr. of the behavior and appearance of yr. old White Leghorn hens. Morphology of thyroids and ovaries of normal and experimental birds is presented. *W. L. Frantz.* (Biological Abstracts)

**FRAPS, R. M.** 1954. (Bur. Anim. Industr., U.S. Dep. Agric., Beltsville, Md.)
TIMING FUNCTIONS OF A NEURAL COMPONENT IN THE MECHANISM OF RELEASE OF PITUITARY GONADOTROPHIN FOR OVULATION IN THE HEN. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 170-173.—The neural apparatus shows a diurnal rhythm in thresholds of response to excitation hormones. A continuation of the work reported in *W.P.S. Jour.* (April-June 1955) Page 164. (Animal Breeding Abstracts)

**GARREN, HENRY W.,** and **C. S. SHAFFNER.** (U. Maryland, College Park.)
YOUNG TURKEYS ARE MORE RESISTANT TO MUSCULAR FATIGUE THAN YOUNG CHICKENS. *Poultry Sci. 33:* 866-867. 1954.—Chickens and turkeys 30 days of age were exercised in slowly revolving cages until exhausted. The mean number of revolutions to exhaust the chickens and turkeys was 214 and 2485, respectively. The wts. of the pituitary, thyroids, adrenals, spleen and bursa of Fabricius in relation to body wt. were smaller for the turkeys than for the chickens. No apparent reason was found for the wide species difference observed.—*Authors.* (Biological Abstracts)

**GEORGE, C. J.,** and **K. R. MENON.** (Wilson Coll., Bombay, India.)
THE PHYSIOLOGICAL LAG OF THE DOMESTIC FOWL. *Jour. Animal Morphol. and Physiol. 1:* 77. 1954. (Biological Abstracts)

**GERICKE, A. M.,** and **ERASMUS, J.** 1954. (Univ. Pretoria.)
FEATHER MEASUREMENTS, EGG PRODUCTION AND BODY WEIGHT. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 41-42.—Observations on White Leghorn pullets have indicated that the length of the rachis of the 10th primary wing feather is not a reliable criterion for distinguishing between high and low egg producers. There was, however, a positive and significant correlation between rachis length and body weight at 180, 248 and 300 days of age, the corresponding values of *r* being 0.26, 0.33 and 0.21 resp. (Animal Breeding Abstracts)

**HAVERMANN, H.** and **SCHARPENSEEL, H. W.** (Abteilung Kleintierzucht und haltung des Instituts für Tierzucht und Tierfütterung der Universität Bonn.)
TESTS WITH RADIO'ACTIVE PHOSPHORUS 32P WITH HENS. *Archiv für Geflugelkunde. 17:* 5. 1953.—The distribution and the rate of

incorporation of P32 in two laying hens as experimental animals are studied. The results received by the method of indicator-experiment are shown in two figures. From the differences between the percentage of the individual organs and tissues to the total phosphorus of the animal-body and the percentage activity to the total activity of the animal is to infer that the distribution of the incorporated P 32 in the individual organs and tissues is very different during the diverse stages of life. Autoradiographic results allowed perceptions with regard to the distribution of the phosphorus in the individual organs and tissues.

**KAUFMAN, L.,** and **R. GANCARCZYK.** 1954. (Instytut Zootechniki.)
STUDIES ON THE SEASONAL CHANGES IN FECUNDITY AND HATCHABILITY OF POLISH GREENLEG CHICKENS. *Roczniki nauk rolniczych, Tom 68-B-1:* 109-114. 1954.—A small flock of polish Greenlegs consisting of 10 chickens and a rooster were studied in respect to fertility and hatchability during the following months: August, September, October, November, December, February, March, April and May.

The average percent of fecundity in the flock decreased as the length of the day decreased, the highest percent being noted in February (Table 2). On the other hand no correlation was noted between the season of the year and hatchability.

Whetham (7) states that the highest rate of egg production tends to be correlated with increasing day-length. It is known that the size of testicles in wild birds as also in drakes is increased by lengthening the light period to which the birds are exposed. According to Hays the fertility of roosters can be increased by irradiation of the birds with artificial light or by hormone injections. The study under discussion shows that a natural rhythm of fertility in Greenleg roosters exists connected with the season of the years (Photoperiodicity).

From the above results and considerations the following conclusions can be stated for the use of practicing breeders and poultry incubation centers: the fertility of roosters decreases as the day length decreases. This can be counteracted by artificial lighting of chicken coops during the period of shortest days. (Abstract)

**KAUFMAN, L., and GANCARCZYK, R.** 1954. (Dep. Exp. Biol., Zootech. Inst., Pulawy.)
BADANIA NAD SEZONOWYMI ZMIANAMI PROCENTU ZAPLODNIENIA I WYLEGOWOSCI ZIELONOZEK. [STUDIES ON SEASONAL CHANGES IN THE PERCENTAGE OF FERTILITY AND HATCHABILITY IN POLISH GREENLEGS.] *Roczn. Nauk rol., B. 68:* 109-114.—Observations have confirmed that fertility tends to increase with day length and to decrease as the days shorten. The percentage of fertile eggs was lowest in Dec. (63%) and highest in Feb. (100%). There was no correlation between season of year and hatchability. In this flock of 10 hens hatchability was lowest in Sep. (62.9% of fertile eggs) and highest in Dec. (93.3%). (Animal Breeding Abstracts)

**KODINEC, Gy.,** and **K. KOVACS, E.**
REARING CHICKEN AT LOWER TEMPERATURE AND WITH REST PERIODS. [CSIRKENEVELES ALACSONYABB HOFOKON PIHENTETESSEL.] *Allattenyésztés, Budapest. 4:* 361-365, 1953. *(Hungarian Agricultural Review. 3*(2): 20, 1954.).—The authors examined at the Poultry Dept. of the Research Institute for Small Animals of Gödölló, as to how the growth of the chickens, the growth of the feathers and the general state of health are influenced if the chicks, contrary to the temperature of the so far customary rearing system, are reared in a lower temperature, while sleep and rest are assured for them from time to time. In order to examine this method, the authors studied the data of the Soviet experiments stating that the cortex cells of the central nerve system regain their working capacity during the resting time, and that sleep has a favourable influence on the promotion of digestion. For the experiments 2 groups of 237 chicks, all of Hungarian yellow hens, were formed. In the premises of the experimental group, the temperature could be regulated and the premises could be systematically darkened. The 26-25°C temperature of the 1st to 5th days was gradually sunk to 16°C up to the 30th day. The darkening was carried through systematically, 2 to

4 times daily and the duration of each was one hour. The chicks of the control group were reared in the usual way in the other half of the premises. In the course of the 90 day experiment it was established that the rhythm of the feathers of the experimental chicks was more favourable, the development of the inner organs was quicker, cases of death were fewer, the weight-increase was better (average weights 30 days old 139.3 g. at 90 days 890.5 g. against control-group 129.2 g. respt. 856.3 g.). The final result of the new rearing result will be established after the end of the first laying year.

**KONOPLEV, N. A.** 1954.
VLIJANIE RAZLICNYH KOMPLEKSOV VNESNIH FAKTOROV (TEMPERATURY, VLAZNOSTI I SKOROSTI DVIZENIJA VOZDUHA) NA ROST I RAZVITIE ZARODYSA KURICY. [THE EFFECT OF VARIOUS COMBINATIONS OF EXTERNAL FACTORS (TEMPERATURE, HUMIDITY AND SPEED OF AIR CURRENT) ON GROWTH AND DEVELOPMENT OF THE FOWL EMBRYO.] INKUBACIJA JAIC SELJSKOHOZJAISTVENNOI PTICY. [INCUBATION OF THE EGGS OF DOMESTIC BIRDS.] *Trud. naucissled. Inst. Pticev., 24:* 211-221.—(Animal Breeding Abstracts)

**KOPLING, E.** (Mrs. Kovács.) 1953.
A MAGYAR TYUK HAROM SZINVALTOZATANAK ERTEKMERO TULAJDONSAGAI GODOLLON. [THE PRODUCTIVE QUALITIES OF THREE COLOUR VARITIES OF HUNGARIAN HENS.] *Agrártudomány, 1953* (12): 372-377. From abstract in *Hung. agric. Rev.*, 1954, 3(2): 20.—Hungarian hens at the Poultry Department of the Research Institute at Gödöllö are white, yellow or barred. The av. egg weight was 55 g.; it was 2.9-6.2% greater in the 2nd than in the 1st year. There was no appreciable difference in the weight of the eggs produced by hens of different colours. The growth and feathering of chicks were good; at 10 wks. live weight averaged 21-24.4% of pullet weight. Hatchability of eggs produced in the 3rd year was better than that of eggs produced in the 2nd year. Mortality of chicks hatched from eggs laid in the 1st year was high. (Animal Breeding Abstracts)

**KUCKOVSKAJA, E. N.** 1954.
SROKIHRANENIJA JAIC KUR I PRODOLZITELJNOSTJ PROGREVANIJA IH PERED OTBOROM DLJA INKUBACII. [THE TIME OF STORAGE AND DURATION OF HEATING HENS' EGGS BEFORE SELECTION FOR INCUBATION.] INKUBACIJA JAIC SELJSKOHOZJAISTVENNOI PTICY. [INCUBATION OF THE EGGS OF DOMESTIC BIRDS.] *Trud. nauc.-issled. Inst. Pticev., 24:* 170-175.—Using 5148 eggs, experiments were carried out by heating the eggs for 9-18 hrs. at 37.5°-40.5° on any of the 1st-10th days after laying; the eggs were then candled and those with the largest embryonic disc selected for incubation. Best hatchability percentages were obtained with eggs heated for 15 hrs. 2-6 days after laying. After heating the eggs could be kept without deterioration for 10 days before incubation. (Animal Breeding Abstracts)

**KUCKOVSKAJA, E. N.** 1954.
KACESTVO PETUSKOV, VYVEDENNYH DO I POSLE 20,5 SUTOK INKUBACII. [THE QUALITY OF COCKERELS HATCHED WITHIN OR OVER 20.5 DAYS OF INCUBATION.] INKUBACIJA JAIC SELJSKOHOZAIST-VENNOI PTICY. [INCUBATION OF THE EGGS OF DOMESTIC BIRDS.] *Trud. nauc.-issled. Inst. Pticev., 24:* 200-204.—Compared with ♂ chicks hatched out in the second half of the 21st day, those hatched out in the first half were stronger and a larger percentage survived; the ♀♀ with which they were subsequently mated produced a higher percentage of fertile eggs. (Animal Breeding Abstracts)

**LAKE, P. E.** 1954. (Poult. Res. Centre, Edinburgh.)
THE RELATIONSHIP BETWEEN MORPHOLOGY AND FUNCTION IN FOWL SPERMATOZOA. *Sect. Pap. 10th World's Poult.*

*Congr.* [*Edinb.*], 1954: 79-85.—Investigations were made to determine the fundamental causes of loss of fertilizing ability of spermatozoa during the period between artificial collection of the semen and the insemination of the hen. The application of cytochemical tests to spermatozoa at succeeding intervals of time *in vitro* shows that the cytoplasmic layer gradually disrupts and thus renders the chromosomal material more susceptible to damage by substances diffusing from the storage medium and fluids secreted in the ♀ oviduct. The disruption of the cytoplasmic layer is accompanied by loss in sperm fertility. The junction between the head and the midpiece of the spermatozoon seems to be particularly vulnerable.

In addition to the spermatozoa and secretions from the seminiferous tubules and epididymal region of the ♂ tract, "semen" obtained from cocks by artificial means usually contains one or more of the following components: clear buff-coloured fluid, white solid material, highly viscous colourless fluid, clear watery fluid (normally present) and faeces. Substances contained in the above, no doubt derived from the rectum or ureters during the excitation of the cock, cause the cytoplasmic structure of the spermatozoa in stored semen to become disrupted. More excitable cocks give a greater amount of the clear watery fluid than do those which are less excitable. It has been shown that semen samples containing none of this fluid, or only a little, can be stored *in vitro* for a much longer time than samples containing large amounts. If the cytoplasmic layer of the spermatozoon can be stabilised to protect the vital material in the head it is likely that the deep-freeze method may prove very suitable for the storage of fowl semen. (Animal Breeding Abstracts)

**LANDAUER, WALTER.** (U. Connecticut, Storrs.)

ON THE CHEMICAL PRODUCTION OF DEVELOPMENTAL ABNORMALITIES AND OF PHENOCOPIES IN CHICKEN EMBRYOS. *Jour. Cell. and Comp. Physiol. 43(Suppl. 1):* 261-305. 1954.—A general review of the author's experiments concerning the effects of insulin, eserine, boric acid and pilocarpine on development of the chicken embryo. The discussion deals chiefly with the results of treatment after 4-5 days of incubation. The morphological features, the influence of dosage and developmental stage at the time of treatment, the role played by genotype, maternal constitution and gene modifiers, the existence of seasonal trends and related factors as they bear on the experimental results are discussed. The selective affinities of the various teratogenic compounds and their interference with embryo metabolism are reviewed, with particular reference to protective metabolic supplements. The general discussion of the results culminates in the following conclusions: (1) Modifications of development with morphologically similar end-effects can be produced by chemically specific interference at different points along one and the same pathway of metabolic functions. (2) The occurrence of syndromes of malformations involving several independent parts and organs of the embryo finds its explanation in relatedness of metabolic requirements during particular sensitive stages of development. (3) The development defects under discussion are brought about by an intervention in metabolic events on the cellular level.—*Auth.* (courtesy Wistar Bibl. Serv.).

**LAVEDAN, J.,** and **DEMAY, M.** 1951.

ETUDE SUR LA STERILITE DES HYBRIDES. [STUDY ON THE STERILITY OF HYBRIDS.] *Arch. Zool. exp. gén., 88* (Notes Rev.): 85-95.—The hypothesis that sterility in hybrids is due primarily to disturbed hormonal mechanisms rather than to chromosomal incompatibility is discussed. Detailed cytological investigations on the testes and ovaries of hybrids between *Cairina moschata* and *Anas boschas* have shown that the degree of development of these organs varies markedly between individuals. The most advanced stage of spermatogenesis reached was the formation of spermatids. Some of the advanced ovaries were normal in appearance, with oocytes at all stages of development. Two of the ♀ hybrids laid small, infertile eggs with very small yolks. (Animal Breeding Abstracts)

**LEROY, P.** (Coll. France.)
REACTIONS TISTICULAIRES DE L'OISEAU SOUMIS A DES INJECTIONS DE CORTISONE. [EFFECTS OF CORTISONE INJECTIONS ON BIRD TESTES.] *Ann. Endocrinol. 13:* 991-997. 1952.—Six months old cockerels and drakes received cortisone injections over a 12-day period. Testes of the controls were all in a prespermatogenic state whereas all treated groups showed active spermatogenesis.—*R. A. Edgren.* (Biological Abstracts)

**MA, C. S.** 1954. (Coll. Agric., Nat. Taiwan Univ., Taiwan, Formosa.)
MECHANISM OF DIFFERENCE IN GROWTH RATE BETWEEN COCKERELS AND PULLETS. *Poult. Sci., 33:* 1028-1031.—The av. live weight at 12 wks. of 6 ♂ and 6 ♀ chicks fed the same rations was 930.3 and 790.0 g. resp. The av. live weight at the same age of 6 ♀ chicks on the same rations but receiving intramuscular injections of 2.5 mg. testosterone twice weekly for the last 9 wks. was 925.5 g.; that of 6 ♂ chicks receiving similar treatments was 875.0 g. (Animal Breeding Abstracts)

**MORRISON, MARY A., BARBARA A. McLAREN, and WILLIAM J. STADELMAN.** (State Coll. Washington, Pullman.)
CHARACTERISTICS OF A FATTY ACID OXIDASE FROM ADIPOSE TISSUE OF THE HEN. *Poultry Sci. 33:* 401-406. 1954.—A fatty acid oxidation enzyme was expressed from adipose tissue of hens. After incubation for 18-24 hours at 37°C in a buffer soln., pH 7.0, the enzyme was active and measured on a Bancroft-Warburg apparatus. The filtered system oxidized octanoic, myristic, palmitic, stearic, oleic and linoleic acids. The system used adenosine-5-phosphoric acid and adenosine tri-phospate equally well but gave a higher uptake with adenosine 5-phosphoric acid when myristic and oleic acids were used as substrates. $CN^-$, $H_2NOH$ and arsenite completely inhibited oxidation, sodium azide and sodium diethyldithiocarbamate inhibited by 80%, while sodium fluoroacetate inhibited by 40%. Malonate and potassium and ferricyanide and antioxidants had no effect.—*W. J. Stadelman.* (Biological Abstracts)

**NISHIYAMA, HISAYOSHI.**
STUDIES ON THE PHYSIOLOGY OF REPRODUCTION IN THE MALE FOWL. III. ON THE ADDITION OF TRANSPARENT FLUID TO THE COCK'S SEMEN. [IN JAPANESE WITH ENGLISH SUMM.] *Sci. Bull. Fac. Agric. Kyushu Univ. 13(1/4):* 377-387. Illus. 1951.—A considerable amount of transparent fluid, which flowed presumably out of the phallus or lymph-fold or both, is added to the dense semen in vas deferens at the moment when it is ejected; and so the ejaculated semen of a cock is considered to be a mixture of the dense semen in vas deferens and the transparent fluid. The greater part of the vas deferens semen which is able to be collected by repeated manipulations is ejected in the first manipulation, and the bulk of semen is reduced markedly to smaller amount in the following manipulations. The rate of reduction of ejected transparent fluid, however, is lower, so that, the more repeatedly the manipulations occur the more dilute the collected semen becomes. There is considerable variation in the amount of ejected transparent fluid among individuals, while slight differences in the amount of ejected semen from the vas deferens among individuals are found, and so a large amount of dilute semen is collected from individuals which eject more transparent fluid. It seems that the vas deferens secretes and adds a small amount of some fluid to the semen in it, and the semen in the vas deferens becomes gradually more dilute in successive daily collection of the semen. The transparent fluid seems to be also ejected at the time of normal copulation. A continuation of the work reported in *Poultry Sci. Jour.* (April-June 1955) Page 169.—*Auth. summ.* (Biological Abstracts)

**NOWINSKI, W. W., and W. D. YUSHOK.** (U. Texas Med. Branch, Galveston.)
GROWTH AND METABOLIC ACTIVITIES OF DEVELOPING WINGS AND LEGS OF THE CHICK EMBRYO. *Biochim et Biophys Acta 11:* 497-506. 1953.—The multiplicative growth rates of wings and

legs of 5-to 12-day chick embryos were calculated on the basis of desoxyribosenucleic acid (DNA) which was extracted according to Schneider's method and estimated with Dische's diphenylamine reagent. The overall average and range of DNA content per million nuclei were the same for the legs and the wings. On a semi-logarithmic scale, the increases in DNA and wet weight showed a linear trend for both appendages. On the 5th day of incubation, the mean DNA content per wing was not significantly different from that of a leg. During further development, the legs accumulated DNA at an appreciably higher rate than the wings. The instantaneous rate of DNA increase was calculated. The ratio of these rates (leg/wings) was highest at the 6-7 day interval. During the 5-8 day periods, the times required for the quantity of DNA per leg to double were between 25-27 hours; those per wing, between 32-39 hours. The rates of increase of DNA (cell number) were compared with those of wet weight (overall growth) and were found to be lower. The unit DNA as an expression of a given cell population was suggested as a reference for metabolic studies.—*Authors.* (Biological Abstracts)

**OLSEN, M. W.,** and **MARSDEN, S. J.** 1954. (Agric. Res. Center, Beltsville, Md.)
NATURAL PARTHENOGENESIS IN TURKEY EGGS. *Science, 120:* 545-546.—During an 8-wk. period of observation (6th March-10th May, 1954) 2537 eggs were laid by 79 virgin Beltsville White turkey hens which had been segreated from their immature ♂ pen-mates before 6 wks. of age. Parthenogenetic development was observed in 568 or 22.4% of these eggs. In 492 eggs, the development consisted solely of the growth of the extraembryonic membranes. In 49, differentiation had proceeded to the extent that blood islands or blood vessels were visible macroscopically. In 27, embryos at various stages of development were identifiable on gross examination. Seven out of 8 embryos which had developed to or beyond the size of normal 9-day embryos appeared to be perfectly formed. In each of 4 instances where the sex was determined, the embryo was ♂. All except one of the advanced embryos were produced by daughters of a ♂ with a history of retarded sexual maturity. Cytological studies indicated that the parthenogenetic embryos carry the diploid number of chromosomes. (Animal Breeding Abstracts)

**ORLOV, M. V.** 1954.
VLIJANIE NEKOTORYH FAKTOROV NA PRODOLZITELJNOSTJ INKUBACII JAIC KUR. [THE EFFECT OF VARIOUS FACTORS ON THE INCUBATION PERIOD OF HENS' EGGS.] INKUBACIJA JAIC SELJSKOHOZJAISTVENNOI PTICY. [INCUBATION OF THE EGGS OF DOMESTIC BIRDS.] *Trud. nauc.-issled. Inst. Pticev., 24:* 205-210.—The eggs of pullets required a shorter incubation time than those of older hens. There was a tendency for eggs produced by hens with a high body weight to require longer. A longer period was needed by large eggs and by eggs stored before setting. There was no relation between the number of eggs produced by a hen before incubation and incubation period. (Animal Breeding Abstracts)

**ORLOV, M. V.** 1954.
OTBOR OPLODOTVORENNYH JAIC S SILJNYMI ZARODYSAMI. [THE SELECTION OF FERTILIZED EGGS WITH STRONG EMBRYOS.] INKUBACIJA JAIC SELJSKOHOZJAISTVENNOI PTICY. [INCUBATION OF THE EGGS OF DOMESTIC BIRDS.] *Trud. nauc.-issled. Inst. Pticev., 24:* 156-169.—In 1951-52 on various farms over 200,000 hens' eggs were used in the experiment. Before incubation some of the eggs were heated at 37.5° for 12 hrs. and then cooled and the size of the embryonic disc ascertained. By selecting for incubation those eggs with the best embryonic discs hatchability was increased. (Animal Breeding Abstracts)

**ORLOV, M. V.,** and **KUCKOVSKAJA, E. N.** 1954.
POVYSENIE ZIZNESPOSOBNOSTI I PRODUKTIVNOSTI KUR NAPAVLENNYM VOZDEISTVIEM VNESNIH USLOVII VO VREMJA INKUBACII. [INCREASED VITALITY AND PRODUCTION OF

HENS DUE TO ENVIRONMENTAL EFFECTS DURING INCUBATION.] INKUBACIJA JAIC SELJSKOHOZJAISTVENNOI PTICY. [INCUBATION OF THE EGGS OF DOMESTIC BIRDS.] *Trud. nauc.-issled. Inst. Pticev., 24:* 185-199.—In 1949-51 eggs of White Leghorn hens were subjected to a temperature 1° higher, humidity 15-17% higher and increased air currents during the first 6 days of incubation; the regime normal to the incubator was used for the rest of the incubating period. Compared with chicks hatched from eggs treated normally throughout incubation, the experimental chicks hatched out 4-5 hrs. earlier and developed more quickly; age at 1st egg was less and egg production in the 1st season was greater. (Animal Breeding Abstracts)

**PRICKER, I. Ja.** 1954.
OHLAZDENIE KAK ELEMENT REZIMA INKUBIROVANIJA UTINYH JAIC V INKUBATORAH S PRINUDITELJNOI CIRKULJACIEI VOZDUHA. [COOLING AS A FACTOR IN THE REGIME OF INCUBATING DUCK EGGS IN INCUBATORS WITH UNAVOIDABLE AIR CIRCULATION.] INKUBACIJA JAIC SELJSKOHOZJAISTVENNOI PTICY. [INCUBATION OF THE EGGS OF DOMESTIC BIRDS.]*Trud. nauc.-issled. Inst. Pticev., 24:* 95-100.—Batches of duck eggs were given cooling intervals at various periods during incubation; some were not cooled. The same treatments were applied in full, 1/2-full and 2/3-full incubators. It is concluded that percentage hatchability is not considerably affected by cooling, which is, however, unavoidable when the incubator is full of batches of eggs at different times. (Animal Breeding Abstracts)

**SOROKA, M. F.** 1954.
REZIM I TEHNIKA INKUBIROVANIJA JAIC UTOK BEZ OHLAZDENIJA V SKAFNYH INKUBATORAH. [REGIME AND TECHNIQUE OF INCUBATING DUCK EGGS WITHOUT COOLING IN CABINET INCUBATORS.] INKUBACIJA JAIC SELJSKOHOZJAISTVENNOI PTICY. [INCUBATION OF THE EGGS OF DOMESTIC BIRDS.] *Trud. nauc.-issled. Inst. Pticev., 24:* 101-118.—At the state farm for poultry breeding, "Pticnoe," 3 groups of duck eggs were subjected to various temperatures, humidities and air currents from the 14th day of incubation. Best results were obtained with a temperature of 37.3°-37.4°, a humidity of 56-58%, and air currents at 1 m./sec. Hatchability was increased by placing the eggs horizontally for the first 14 days and then vertically. (Animal Breeding Abstracts)

**SPICER, A.** 1954.
STILBOESTROL AND THE CONTROL OF SEX IN POULTRY. *Brit. vet. J., 110:* 358-359.—When cockerels, in which development of the testes had been delayed 4-5 mths. by the intraperitoneal implantation of 30 mg. stilboestrol, were later used as cock birds, an increase in the percentage of pullets hatched occurred in the 2nd and later generations. Subsequent fertility and hatchability in the flock were unaffected. (Animal Breeding Abstracts)

**STRAHAN, R.,** and **H. WARING.** (U. Western Australia, Perth.)
THE EFFECT OF PITUITARY POSTERIOR LOBE EXTRACTS ON THE BLOOD PRESSURE OF THE FOWL. *Australian Jour. Exptl. Biol. and Med. Sci. 32:* 192-205. 1954.—Pitocin is always depressor; Pitressin is depressor at high base pressures, pressor at low pressures and pressor at all base pressures when the preparation is tolerant to pitocin; all responses to pituitary are subject to tolerance; increased circulatory Mg has no effect on responses to pitocin but in various circumstances it alters the response to Pitressin so that a depression is augmented or an anticipated rise converted to a fall.—*H. Waring.* (Biological Abstracts)

**STURKIE, PAUL D.,** and **DONALD POLIN.** (Rutgers U., New Brunswick.)
THE EFFECTS OF INJECTED PENICILLIN ON EGG FORMATION AND BLOOD CALCIUM. *Poultry Sci. 33:* 209-210. 1954.—White Leghorn hens received within an 8-hour period 300,000 U., intramuscularly, of procaine penicillin, during the period of egg formation. The treat-

ment had no effect upon egg wt., egg size, egg-shell, and other components of the egg, or upon blood Ca.—*P. D. Sturkie.* (Biological Abstracts)

**SZIKORA, A.**

ADVANCED METHODS OF CHICK-HATCHING. [A CSIBEKELTETES FEJLETT MODSZEREI.] *Agrártudomány, Budapest. 1-2:* 36-38,1954. *(Hungarian Agricultural Review. 3(2):* 20, 1954.—The author draws attention to the fact that in spite of great results having been reached by artificial hatching, which today is indispensable in larger scale poultry breeding farms, the results of the brooders are in some instances better, so f. i. with regard to the larger percentual hatchability, and the greater vitality of the chicks. Therefore, he considers the method of J. Horvath and E. Szabo of great importance in the reduction of the percentage of suffocation. He publishes the method arrived at in the course of long experiments and aiming to copy brooding process of the hens in everything. During the experiments it was established that the death of the embryos in the suffocated eggs, occurs mostly on the 18-19th day, when the embryo begins to feed from the yolk, when the respiration of the lungs begins, and when the self-heat of the egg is the highest. Before putting the new method into practice, it is, therefore, considered necessary to reduce the self-heat adequately on the 18-19th day; to increase gradually the change of the air in the air-cell; and to assure greater humidity during pre-hatching and hatching. In the practical solution, they wish to achieve the moderation of the self-heat, and the gradual air-change of the air-cell by cooling, and the suitable formation of the air-cell, on the other hand, by frequent moistenings. They also worked out, how to realize in practice the theoretical findings concerning the gig type (electric) incubator when in function. The practical trials made with the new incubating method proved, that by its application the reduction of the suffocation succeeded to a considerable percentage.

**TABER, ELSIE,** and **KATHRYN, W. SALLEY.** (Med. Coll. South Carolina, Charleston.)

THE EFFECTS OF SEX HORMONES ON THE DEVELOPMENT OF THE RIGHT GONAD IN FEMALE FOWL. *Endocrinology 54:* 415-424. 1954.—Brown Leghorn chicks were ovariectomized during the 1st 3 weeks after hatching. Of these, 20 were implanted with pellets of estradiol benzoate, and 10 with pellets of testosterone propionate at the time the ovary was removed. The rudimentary right gonad of each of 7 controls developed into a typical "ovotestis," composed of sterile testis-like tubules and cords of cells, and secreting androgen and estrogen in quantities sufficient to produce large, erect, red combs and feminine plumage, respectively. Development of the rudimentary gonad was inhibited in 65% of the estrogen-treated and 60% of androgen-treated birds. Of the estrogen-treated, 35% and of the androgen-treated, 40% developed ovarian-like gonads containing follicles. When the pellets were removed from birds in which no gonadal tissue was noted at 92 days, 67% developed typical "ovotestes." There was a significant reduction in the weight of the anterior lobe of the pituitaries from treated birds.—*Authors.* (Biological Abstracts)

**TANDON, H. P.,** and **IYER, S. G.** 1954. (Indian Vet. Res. Inst., Izatnagar.)

SOME OBSERVATIONS ON SPURS IN FEMALE CHICKENS. *Sect. Pap. 10th World's Poult. Cong.* [*Edinb.*], 1954: 13-16.—A comparison was made between White Leghorn hens with spurs and W.L. hens from the same flock without spurs in respect of various economic characters. The results indicate that the development of spurs has no significant effect on rate of growth, age at sexual maturity, 1st year egg production, egg fertility, egg hatchability, mortality, or sex ratio. Spurred hens do not differ from non-spurred hens in their transmission of the above economic characters to their daughters. Spurred daughters were obtained from non-spurred as well as from spurred dams. One of the sires used in the experiments appeared to have a favourable influence on the devolopment of spurs in his daughters while another apparently had an adverse effect. A third sire produced spurred daughters from non-spurred dams and none from spurred dams. (Animal Breeding Abstracts)

**TIENHOVEN, A. van, A. V. Nalbandov, and H. W. Norton.** (U. Illinois, Urbana.)
EFFECT OF DIBENAMINE ON PROGESTERONE-INDUCED AND "SPONTANEOUS" OVULATION IN THE HEN. *Endocrinology 54:* 605-611. 1954.—Using the first egg of a clutch in regularly laying hens, it was shown that Dibenamine is capable of blocking spontaneous as well as progesterone-induced ovulations. It was shown that a neural mechanism is involved in spontaneous as well as in progesterone-induced ovulations. Dibenamine blocks spontaneous ovulations most effectively when injected 14 hours before ovulation and is progressively less effective at 10, 8, 6, and 4 hours. At 12 hours, an unexplained low rate of blocking was observed.—*Authors.* (Biological Abstracts)

**TOMHAVE, A. E.** (U. Delaware, Newark.)
INFLUENCE OF ARTIFICIAL LIGHTS DURING REARING ON THE EGG PRODUCTION OF OCTOBER-HATCHED NEW HAMPSHIRES. *Poultry Sci. 33:* 725-729. 1954.—Oct. hatched N. Hamp. pullets were supplied artificial lights during rearing, of such duration to simulate amt. daylight available to pullets hatched in Mar. Pullets subjected to lights during rearing reached 25% and 50% egg production 7 and 14 days later, respectively, than control pullets reared without lights. Total egg production to 23 wks. of age by light-reared birds was equal to 53% of prod. of controls. During laying period of 164 days, pullets reared with lights produced a slightly higher percent of 22 and 23 oz./doz. eggs than pullets reared without lights. There was little difference between the two groups of pullets in mortality, rate of lay, and hatchability of eggs during the laying period.—*A. E. Tomhave.* (Biological Abstracts)

**TRETJJAKOV, N. P.** 1954.
INKUBACIJA JAIC INDEEK. [THE INCUBATION OF TURKEY EGGS.] INKUBACIJA JAIC SELJSKOHOZJAISTVENNOI PTICY. [INCUBATION OF THE EGGS OF DOMESTIC BIRDS.] *Trud. nauc.-issled. Inst. Pticev., 24:* 13-32.—The temperature of eggs was studied during natural incubation. Using batches of 300-500 eggs, results were compared between natural and artificial incubation. Loss in egg weight was greater during natural incubation. Hatchability averaged 85.4% by natural incubation and 69.9% by artificial incubation. Actual hatching lasted 30-36 and 40 hrs. resp. by the 2 methods. Hatchability was increased by 3.61% when the eggs in the incubator were cooled, and by 5.08% when they were cooled and subjected to sunlight. (Animal Breeding Abstracts)

**TRETJJAKOV, N. P.** 1954.
INKUBIROVANIE GUSINYH JAIC PRI PONIZENNOI VLAZNOSTI S PRIMENENIEM GLUBOKIH OHLAZDENII IH (PEREMENAJA TEMPERATUREA). [THE INCUBATION OF GOOSE EGGS WHEN HUMIDITY IS REDUCED AND COOLING INTRODUCED (CHANGED TEMPERATURE).] INKUBACIJA JAIC SELJSKOHOZJAISTVENNOI PTICY. [INCUBATION OF THE EGGS OF DOMESTIC BIRDS.] *Trud. nauc.-issled. Inst. Pticev., 24:* 63-66.—A series of experiments was carried out at a number of hatcheries in 1951-52. From the 15th day of incubation humidity was reduced, and the eggs were cooled twice daily until about the 27th day and then more frequently. Results all showed increased hatchability compared with those of uncooled eggs. (Animal Breeding Abstracts)

**TRETJJAKOV, N. P., and PELJTCER, S. O.** 1954.
INKUBACIJA JAIC CESAROK. [THE INCUBATION OF GUINEA FOWL EGGS.] INKUBACIJA JAIC SELJSKOHOZJAISTVENNOI PTICY. [INCUBATION OF THE EGGS OF DOMESTIC BIRDS.] *Trud. nauc.-issled. Inst. Pticev., 24:* 33-39.—At the Bratcev poultry hatchery, guinea fowl produce an average of 100-120 eggs per year. Hens come into production at 1 yr. and continue producing for 4-5 yrs. In ♂♂ sexual activity begins in spring and increases in intensity until the end of May; each ♂ mates with 3-4 ♀♀. At the beginning of the season only 60-70% of the eggs are fertile, later rising to 80-85%.

Egg weight increases from 40-41 g. in March to 46-47 g. in Aug. and then decreases. The composition of guinea fowl eggs is compared with that of fowl and turkey eggs. When domestic hens and turkeys are used for incubating guinea fowl eggs, there is 80-90% hatchability. The regime for artificial incubation is similar to that used for the eggs of domestic hens and is described: hatchability is 70-80% of the eggs set. (Animal Breeding Abstracts)

**VIDAL, A.**
INFLUENCE DE LA THIOUREE SUR LE DEVELOPPEMENT DE L'EMBRYON DE POULET. [INFLUENCE OF THIOUREA ON DEVELOPMENT OF THE CHICK EMBRYO.] *Ann. Endocrinol. 13:* 982-990. 1952.—Thiourea injected at 7 days caused a generalized retardation of development; no specific abnormalities appeared. A repeat injection at 15 days further retarded development. At 0 or 48 hrs. incubation Thiourea caused no abnormalities in development although mortality was high. Thiourea appeared to have no effect on development prior to the initiation of thyroid function.—*R. A. Edgren.* (Biological Abstracts)

**VLADIMIROVA, Ju. N.** 1954.
POTERJA V VESE JAIC PERED INKUBACEI. [LOSS IN EGG WEIGHT BEFORE INCUBATION.] INKUBACIJA JAIC SELSKOHOZJAISTVENNOI PTICY. [INCUBATION OF THE EGGS OF DOMESTIC BIRDS.] *Trud. nauc.-issled. Inst. Pticev., 24:* 126-155.—In a series of experiments 5716 hen eggs were used. Eggs losing least weight during storage for 10 days had the best hatchability. Loss in egg weight was affected by season, age of hen, egg size, shell characters and environmental factors. The relation between loss in weight and internal egg composition was also studied. (Animal Breeding Abstracts)

**VLADIMIROVA, Ju. N.** 1954.
INKUBACIJA JAIC GUSEI. [THE INCUBATION OF GOOSE EGGS.] INKUBACIJA JAIC SELJSKOHOZJAISTVENNOI PTICY. [INCUBATION OF THE EGGS OF DOMESTIC BIRDS.] *Trud. nauc.-issled. Inst. Pticev., 24:* 67-81.—At the Poultry Breeding State Farm, "Boljsevik," 6228 eggs were set in 6 lots between 9th March and 18th April. Hatchability averaged 51.1% of the eggs set and 67.3% of the fertile eggs set. Of all eggs set 24.1% were infertile and 4% had blood spots. By turning some of the eggs through 180° hatchability was increased by 16.3-20.6% compared with that of eggs turned through 45°. The percentage of infertile eggs increased considerably when eggs were kept longer than 10 days before incubation. Results are tabulated. (Animal Breeding Abstracts)

**WEBER, F., and LORTSCHER, H.** 1954. (Swiss Fed. Inst. Technol., Anim. Breed. Inst., Zurich.)
CONCERNING THE INFLUENCE OF ENVIRONMENT ON THE FERTILITY OF WHITE LEGHORN COCKS (S.C.W.) OF DIFFERENT ORIGIN. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 37-41. English and French summaries in *Summ. Sect. Pap.:* 7-8.—A study of relevant literature suggests that the fertility of the domestic fowl may possibly be influenced in considerable measure by nonlinear interactions between environment and genotype. To test the validity of this assumption the relations between the fertility of Leghorn cocks of various origin and the ambient temperature were investigated on Swiss poultry farms for the years 1952 and 1953. The available material consisted of 30 breeding flocks with 15 cocks of Swiss origin, 11 cocks from 2 American inbred lines, 3 cocks of mixed Swiss-American stock, 1 cock from the crossing of the 2 American inbred lines.

The fertility rate is modified by the ambient temperature at the mating time. However, differences exist from cock to cock in the reaction to temperature variations. For cocks of Swiss stock the fertility rate is positively correlated with the temperature. For American inbred-cocks, with one exception, the fertility drops down very strongly at temperatudes near 0° C in the absence of artificial illumination, and rises again at temperatures below 0°C. This difference in behaviour has been ascertained statistically by the determination of a significant interaction be-

tween temperature and origin. It is probable that in addition to the temperature the duration of exposure to light exerts an influence on fertility. The variance of the fertility rate increases with the degree of homozygosity of the cock. Cocks from inbred lines seem to have less resistance to variable environmental conditions and their effect on fertility than crossbred cocks. (Animal Breeding Abstracts)

**WILCOX, F. H. JR.,** and **R. K. COLE.** (Cornell U., Ithaca, N.Y.)
STUDIES ON THE LYSOZYME CONCENTRATION IN THE EGG WHITE OF THE DOMESTIC FOWL. *Poultry Sci. 33:* 392-397. 1954.—An assay for lysozyme is descr., which is applicable for use with egg white and other highly concentrated sources. Its advantages are temp. control, low dilution of tissue, and increased accuracy. There is no apparent loss of lysozyme titer of egg white after storage at —20°C for 16 weeks. The variation in 4 consecutive eggs laid by the same hen is small, whereas differences between hens exist. Analysis of only 1 egg is recommended in the characterization of a hen with respect to lysozyme concn., except when detection of small differences is desired.—*F. H. Wilcox, Jr.* (Biological Abstracts)

**WILLIER, B. H.** (Johns Hopkins U., Baltimore, Md.)
PHASES IN EMBRYONIC DEVELOPMENT. *Jour. Cell. and Comp. Physiol. 43 (Suppl. 1):* 307-317. 1954.—A brief characterization of the main phases in the time scale of the development of the chick embryo is presented as a basis for gaining some insight into the general nature of the sequential processes that may be altered at a particular time and locus by irradiation and chemical agents. Whether structural or functional in nature, each major phase seemingly comprises a series of less conspicuous steps, and one of which may be regarded as a sensitive phase for the moment of action of the deleterious agents. The broad problem for elucidation is to trace and to characterize more precisely than heretofore the sequence of events that takes place during the period from the beginning of application of the inducing agent to the terminal effect. The prevailing approaches to this problem have been largely confined to a description of the terminal effects, while the analysis of the series of underlying events has not been explored on a scale commensurate with its great importance.—*Auth.* (courtesy Wistar Bibl. Serv.).

**WONG, H. Y. C., N. LAVENDA,** and **E. W. HAWTHORNE.** (Howard U. Sch. Med., Washington, D.C.)
EFFECT OF EXERCISE ON COMB RESPONSES OF ANDROGEN TREATED CAPONS. *Amer. Jour. Physiol. 178:* 269-270. 1954.—Daily exercise for 10 days has a marked effect on comb response of androgen treated capons. Comb increment of birds receiving such treatment is statistically much smaller than those not exercised. There were no significant differences between either the body wt. or adrenal wt. of any of the groups studied. Explanations for the mechanism of depressant effect of exercise on androgenic activity are mentioned.—*H. Y. C. Wong.* (Biological Abstracts)

**WOOD-GUSH, D. G. M.** 1954.
OBSERVATIONS ON THE NESTING HABITS OF BROWN LEGHORN HENS. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 187-192. (Animal Breeding Abstracts)

## NUTRITION

**BAEDER, DAVID H., WILLIAM J. BECKFIELD,** and **JOSEPH SEIFTER.** (U. Pennsylvania, Philadelphia.)
EFFECT OF ALUMINUM HYDROXIDE GELS ON EXPERIMENTAL HYPERCHOLESTEROLEMIA AND ATHEROMATOSIS IN CHICKS. *Proc. Soc. Exptl. Biol. and Med. 86:* 326-329. 1954.—As long as the diet was ingested the addition of 3% $ALOH_3$ gel did not

prevent hypercholesterolemia or atheromatosis in cholesterol-fed chicks. Neither did such a diet result in inanition or paralysis. Normal cholesterol values, inanition, and paralysis developed with rejection of the diet. The stress of inanition did not produce hypercholesterolemia in chicks. Neither cortisone acetate nor boric acid influenced the development of arterial lesions, although the latter had some effect on lipid deposition.—*Auth. summ.* (Biological Abstracts)

**BALLOUN, STANLEY L.** (Iowa State Coll., Ames.)
EFFECT OF HIGH LEVEL AUREOMYCIN FEEDING ON RATE OF EGG PRODUCTION. *Poultry Sci. 33:* 867-869. 1954.—Egg production of hens was markedly improved by adding Aureomycin at 50 mg/lb. to nutritionally adequate diets. It was concluded that the effect was achieved through improved health of the hens fed Aureomycin.—*S. L. Balloun.* (Biological Abstracts)

**BERNIER, P. E.,** and **COONEY, T.** 1954. (Oregon Agric. Exp. Sta., Corvallis.)
BLACK DOWN COLOUR AND RIBOFLAVIN DEFICIENCY IN EMBRYOS OF THE DOMESTIC FOWL. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 66-71.—Observations on black and non-black embryos and chicks from dams fed a diet deficient in riboflavin (88 mg. per 100 lb. mash) support the hypothesis that there is a relationship between melanic pigmentation and riboflavin requirements during embryonic development of the chick. It is suggested that riboflavin is involved in some way, directly or indirectly, in the process of melanin formation and that genes which decrease the intensity or distribution of melanin pigmentation also tend to reduce the riboflavin requirements for normal embryonic development. The percentage of hatchability was increased, particularly in eggs containing black embryos from Cornish dams, by the injection into the air cell of the egg of 0.1 ml. of an aqueous solution of 220 mg. of riboflavin per 100 ml. (Animal Breeding Abstracts)

**BORNSTEIN, SIMON,** and **Y. SAMBERG.** (Government Poultry Field Lab., Tel Aviv, Israel.)
FIELD CASES OF VITAMIN K DEFICIENCY IN ISRAEL. *Poultry Sci. 33:* 831-836. 1954.—A general descr. is presented of the lesions observed in several flocks of chicks, which apparently were suffering from vit. K deficiency, as well as the detailed case-history of a clear-cut case of this deficiency. The therapeutic effect of intramusc. injns. of vit. K (menadione) was detd. in the lab. by testing the blood-clotting-time of affected chicks before these injns. and at certain intervals following them. Chicks assimilated vit. K rather quickly i.e. 1 hr. after the admn. of 2.5 mg the clotting-time was reduced from 120 min. to 7 min., and 2.5 hrs. after injn. of 1 mg vit. K it was shortened from 75 min. to 3 min. Similar striking results were obtained in the field when 400 chicks out of 2500 were thus treated with 1 mg vit. K; while 5% alfalfa meal required approx. 2 days. The chicks were raised on deep litter, and on a standard local diet considered adequate in this country, hence no explanation for this deficiency is available. However, the inclusion of both an antibiotic and a coccidiostat might have altered the intestinal synthesis of vit. K.—*S. Bornstein.* (Biological Abstracts)

**CARLSON, C. W., D. G. BRITZMAN,** and **A. W. HALVERSON.** (S. Dakota State Coll., Brookings.)
AN OBSERVATION ON THE VALUE OF HIGH PROTEIN CEREALS IN A CHICK STARTER RATION. *Proc. S. Dakota Acad. Sci. 32:* 125-129. 1953.—Diets made up of James oats of 19.2% protein content or of Feebar barley of 15.9% protein content, together with soybean meal as a variable supplement to maintain the protein levels at 20%, and also containing the identified vit. and mineral carriers, and procaine penicillin G, were unsatisfactory for the promotion of most rapid early chick growth. An explanation for the unsatisfactory results is based upon the known deficiency for chicks of lysine in oats and barley proteins. The greater rate of growth of chicks fed diets containing ground yellow corn, regular oats, or low protein Feebar barley as the cereal sources, probably

reflects an adequate level of lysine content obtained by the use of high levels of soybean meal in the diets.—*Auth. summ.* (Biological Abstracts)

**CARPENTER, K. J.** (Rowett Res. Inst., Aberdeen, Scotland.)
POULTRY NUTRITION PROBLEMS IN THE UNITED KINGDOM. *World's Poultry Sci. Jour. 10:* 136-140. 1954.— Max. use of non-imported ingredients presents special problems. Barley and oats are the most practical energy sources although inefficient. Byproduct fish meal, peanut meal and cottonseed meal are protein sources. Development of a low fiber energy and protein source from grass has not been commercially successful.—*J. B. Christiansen.* (Biological Abstracts)

**CSONKA, FRANK A., ROBERT J. LILLIE, and W. MARTIN.** (Agric. Res. Admn., U.S. Dept. Agric., Washington, D.C.)
THE MATERNAL DIET AS A SOURCE OF GROWTH FACTORS TRANSMITTED BY THE HEN THROUGH THE EGG TO THE PROGENY. *Jour. Nutrition 52:* 285-296.—The influence of protein in the maternal diet on the growth of the progeny of hens was confirmed. Our findings suggest that besides vit. $B_{12}$ another growth factor exists which is also transmitted through the egg to the chick and may be related to the dietary protein. Vit. $B_{12}$ or dried cow manure as a supplment to chick mash may promote or may inhibit chick growth, depending on the maternal diet and on the length of time the hen is on this dietary regimen. $B_{12}$ supplementation in the maternal diet for an extended period produced greater growth in the progenies than when the $B_{12}$ supplement was offered in the chick's diet.—*Auth.* (courtesy Wistar Bibl. Ser.).

**DABROWSKA, W., L. ZEBROWSKI, K. LEZIAK, and J. BLONSKA.** (Instytut Zootechniki—RNR)
THE EFFECT OF CO ON THE HEMATOPOIETIC REACTIONS. *Roczniki nauk rolniczych, Tom 67-B-2:* 257-268. 1954.—Experiments were carried out on 4 week old Polish Greenleg chickens on the effect of cobalt on the rapidity of blood reaction. They showed that cobalt, administered orally in optimum doses of 0.8 mcg per 100 g of body weight per day, produced the following results: 1) After one half-daily dose hematopoiesis stimulation was observed after as few as fourteen hours. 2) When cobalt was given uninterruptedly as a drench in optimum doses for 85 hours—hematopoietic reaction was more apparent. 3) After cobalt had been administrated for two weeks erythropoietic focis activity tended to return to normal. 4) The withdrawal of cobalt from the diet resulted in the drop of erythropoietic focis activity in as few as sixty hours. 5) The administration of cobalt to chickens previously treated with chinosol failed to produce a growth response, while it stimulated the growth of chickens not so treated. 6) On the basis of these observations it is possible to conclude, that (a) cobalt affected directly the erythropoietic foci of the birds, (b) but did not produce such reaction of the microorganisms weakened by chinosol treatment, which would be favourable for the chickens. 7) Further and more exact studies on this subject are planned. 8) The rapid hematopoietic focis' reaction of chickens in response to small, positive for birds, cobalt doses and the rapid decline of this reaction, suggest the need of permanent cobalt administration at the minimum level and not of large doses at long intervals.

**DA ROCHA, G. L., and H. F. RAIMO.**
CONTRIBUICAO PARA O ESTUDO DOS SUBSTITUTOS DOS FARELOS DE TRIGO NA ALIMENTACAO DAS AVES. *Boletim de Industrial Animal (Brasil):* 14, pp. 31-44. 1954.—This paper reports the experimental work in poultry feeding which consisted in the substitution of wheat bran and wheat flour middlings, by velvet bean seed flour and cow pea seed flour. 1) The velvet bean seed meal when employed in 35 per cent of the ration can not be utilized for feeding chicks. 2) At the 14th week chicks fed with cow pea seed meal presented an average live weight of 90, 21 per cent of the average liveweight of chicks fed with standard rations. 3) The cow pea seed meal, as it was employed in the experiment, can be utilized as a substitutive of the wheat bran and wheat flour middlings. 4) The consumption of cow pea seed meal up to 14 weeks considered from its efficiency showed the following results: Standard

ration—100%; cow pea ration—102%. 5) Concerning to body measurement and feathering characteristics no sensible difference was noted. 6) From 14 up to 30 weeks the pullets fed with cow pea ration weighed in average 16.5 grs less than the pullets fed with standard ration. In the same period the consumption of cow pea ration was 2648, 49 grs less than the standard ration. 7) The pullets sexual maturity of the cow pea lot started 5 days latter (sic) than the standard lot. 8) The pullets of the standard lot produced 2.15 per cent more eggs when compared with the cow pea lot.

**FERGUSON, T. M., R. L. ATKINSON, and J. R. COUCH.** (Texas A and M Coll., College Station.)
RELATIONSHIP OF VITAMIN E TO EMBRYONIC DEVELOPMENT OF AVIAN EYE. *Proc. Soc. Exptl. Biol. and Med. 86:* 868-871. Illus. 1954.—A cloudiness in the central portion of the lens was found in embryos from eggs laid by turkey hens reared on wire and fed an all-vegetable protein diet without added vit. E. Associated with the lens disorder was a hemorrhaged vitreous humor, a smaller embryo with edematous areas on the neck and feet, and a high embryonic mortality between the 24th and the 28th day of the incubation period. Supplementation of the all-vegetable protein diet with alpha. tocopheryl acetate was effective in preventing the anomalous conditions described, while fish solubles, dried whey, or combinations of these substances had no effect.—*T. M. Ferguson.* (Biological Abstracts)

**FERRANDO, R.** 1954. (Ec. Nat. Vét., Lyons.)
HORMONES, ANTIHORMONES ET ANTIBIOTIQUES DANS L'ALIMENTATION DES VOLAILLES. [HORMONES, ANTIHORMONES AND ANTIBIOTICS IN POULTRY NUTRITION.] *Ann. Nutr. [Paris], 8:* 359-388. (Animal Breeding Abstracts)

**GAWECKI, K.** Instytut Zootechniki—RNR.
IRRADIATED FODDER YEAST IN THE AUTUMN AND WINTER FEEDING OF LAYING HENS. *Roczniki nauk rolniczych, Tom 68-B-2:* 253-270. 1954.—The purpose of the study was to determine the feasibility of irradiating fodder yeasts given in feed rations to laying hens during the autumn and winter seasons. The experiments were conducted in 1951/52 on 301 White Leghorns and 107 Rhode Island Reds by giving yeast in an amount equal to 10% of the feed mixture. One of the groups of hens was given one half of the total ration of yeast in an irradiated form. The experiments showed that no actual differences were noted in the health of the hens, laying percentage or chemical composition of the eggshells as being correlated with the feeding of irradiated or non-irradiated fodder yeast. The authors claim that in Polish conditions applying proper breeding fundamentals and feeding of dried fodder yeast in amounts of 10% of the feed concentrate ration results in normal laying of hens even without an addition of cod liver oil.

**GREENBERG, JOSEPH, D. JANE TAYLOR, and HELEN LOUISE TREMBLEY.** (Natl. Microbiol. Inst. Natl. Inst. Health, Bethesda, Md.)
THE EFFECT OF MILK DIETS ON THE COURSE OF SPOROZOITE-INDUCED PLASMODIUM GALLINACEUM INFECTIONS IN CHICKS. *Amer. Jour. Hyg. 60:* 99-105. 1954.—In chicks fed a diet of whole dried milk, supplemented with thiamine, pyridoxine and pantothetic acid, the prepatent period of sporozoite-induced infections of *P. gallinaceum* was significantly increased. A benign (M) strain and a malignant (SP) strain of the parasite behaved similarly. Dry skim milk, similarly supplemented, did not produce an increase in the prepatent period. The inhibition of the infection associated with a whole milk diet was not significantly reversed by supplements of methionine or choline, but it was reversed by trace minerals, especially cupric sulfate. A defined diet, adequate for the growth of chicks, produced no significant increase in the prepatent period of sporozoite-induced, SP strain infections. A defined, high fat diet (25% corn oil, hydrogenated vegetable oil or butter) produced a significant increase in the prepatent period of M strain infections.—*Authors.* (Biological Abstracts)

**HALVERSON, A. W., and C. M. HENDRICK.**

SOME FACTORS AFFECTING THE STABILITY OF CAROTENE IN MIXED FEEDS. *South Dakota Agricultural Experiment Station, Technical Bulletin 14.* 1955.—Carotene storage losses were observed in a corn-soybean diet during a 30-day, 37°C. storage period using various diet modifications as well as several carotene supplements. Study of diet modification by separate addition of common feed ingredients to the diet—15 per cent of oats, wheat bran plus middlings, dried buttermilk, meat scraps or fish meal, 1 and 4 per cent of ground limestone, 1 per cent of steamed bone meal, 2 per cent of urea or trace minerals at two levels—indicated that such modifications caused carotene losses to increase in many instances. The losses increased to a greater extent with oil supplements than with alfalfa, which showed only slight effects from the diet changes. However, since oil carotene was more stable than that of alfalfa in unmodified diets, the extra losses induced in oil supplemented diets by modification caused mainly an equalization of losses among supplements.

Study of modification by variation in the level of alfalfa used in feed mixtures demonstrated an important effect upon carotene stability from change in the kind and amount of feed added as well as the type of alfalfa. These conclusions, based upon data using basal diet-alfalfa mixtures and, in addition, meat scraps-alfalfa mixtures, showed carotene stability to increase with increase in basal diet content or to decrease with increase in meat scraps content of the different mixtures. However, meat scraps mixtures were also observed to impart stability to alfalfa carotene at low meat scraps levels. Similar data obtained with antioxidant-treated alfalfa showed a greater degree of stability and somewhat less variation in losses with different mixtures than was observed with untreated alfalfa.

Study of modification by aging of diets prior to carotene supplementation indicated that both alfalfa and oil sources are affected quite similarily by this variable. Comparison of losses among freshly mixed diets and those aged 2, 4 and 6 months before the stability test period showed that losses were not greatly affected by aging in the basal diet or when meat scraps or a normal trace mineral level or both were present although losses differed some among diets and supplements.

However, losses increased markedly in the trace mineral diets following aging. The age-induced loss generally approached maximum in diets subjected to only the 2-month aging treatment. Since losses induced by aging were larger with oil than with alfalfa supplements, total losses were greater with oil diets in spite of initial greater stability. When meat scraps were present in the diets; losses with alfalfa supplements were reduced, and especially when aging effects were involved. Meat scraps affected the stability of oil type carotene to lesser extent so the net result was a further increase in the superiority of alfalfa over oil when meat scraps were present in high trace mineral, aged diets.

**HARRIS, ROBERT S.** (Massachusetts Inst. Technol., Cambridge), **G. F. MARRIAN** (U. Edinburgh), and **KENNETH V. THIMANN.** (Harvard U., Cambridge, Mass.) (Edited by.)

VITAMINES AND HORMONES. ADVANCES IN RESEARCH AND APPLICATIONS. Vol. XII. xi+305p. *Academic Press Inc.:* New York 10, 1954. Pr. $7.50.—An international group of contributors have joined to produce the 8 reviews presented in this volume. The titles of the various chapters indicate the range of topics covered: "Chemistry of Vitamin $B_{12}$," "The Intestinal Synthesis of Vitamins in the Ruminant," "The Biochemistry and Pathology of Hypervitaminosis A," "Vitamin A Requirements of Animal Species," "Disturbances in nutrition Relating to Liver Disease in Man," "Light Regulation of Hormone Secretion," "Estrogens and Related Substances in Plants," and "Effects of Estrogens on Domestic Fowl and Applications in the Poultry Industry." The coverage is complete and well presented.—*H. M. Vars.* (Biological Abstracts)

**HAVERMANN, H., and SCHARPENSEEL, H. W.** (Abteilung Kleintierzucht und -haltung des Instituts für Tierzucht und Tierfütterung der Universität, Bonn.)

ANTIBIOTICS IN THE METABOLISM OF THE LAYING HEN.

BALANCE AND DISTRIBUTION STUDIES WITH $^{35}$S-N-AETHYL-PIPERIDINE-PENICILLINE. *Archiv für Geflügelkunde. 17:* 193. 1953. —1. After enteral application of labelled Penicillin to laying hens 95% will be excreted in a short time. 2. After 30 hours 96% of total Sulfur and 88.5% of $SO_4$—S already were to be measured in feces. 3. By far the greater part is to be found in organic form. Essentially it is to be considered as Penicillin-compounds and its fissure-products. If Penicillin would have changed in other chemical compounds passing the intestinal tract, by re-absorption the period of excretion would have been delayed. 4. The small amounts of incorporated $^{35}$S surely have changed into S-containing compounds of non-antibiotic character; for the investigation of all eggs, layed during the feeding-period with antibiotics and with a specific activity equal to that of hen-tissues, did not result any bacteriostasis in the microbiological control-test.

**HEYWANG, BURT W., H. R. BIRD, and F. H. THURBER.** (Agric. Res. Serv., Glendale, Arizona.)

OBSERVATIONS ON TWO COMPONENTS OF COTTONSEED THAT CAUSE DISCOLORATIONS IN EGGS. *Poultry Sci. 33:* 763-767. 1954.—In expts. with White Leghorn pullets fed cottonseed and several components of cottonseed, it was found that the material responsible for pink albumen in eggs was present in raw cottonseed and in cottonseed pigment glands but not in cottonseed hulls. The material could be extracted from cottonseed with methyl-ethyl-ketone or isobutane but not with hexane. Pink albumen was found in some eggs 3 days after the diets were fed, and when the eggs were stored the number of eggs with pink albumen increased as the length of the storage period increased. When the diets contained a relatively high content of free gossypol the yolks had a high degree of discoloration. Feeding of cottonseed hulls or a gossypol-glycine compound did not result in yolk discoloration.—*C. A. Denton.* (Biological Abstracts)

**HEYWANG, BURT W.** (U.S. Dept. Agric., Glendale, Arizona), **and H. R. BIRD.** (U.S. Dept. Agric., Beltsville, Md.)

EGG PRODUCTION, DIET CONSUMPTION, AND LIVE WEIGHT IN RELATION TO THE FREE GOSSYPOL CONTENT OF THE DIET. *Poultry Sci. 33:* 851-854. 1954.—In one expt. with laying White Leghorn pullets, raw decorticated cottonseed was in the diets as the source of free gossypol at about the .008, .012, .016, .020, .025, and .033% levels. In another expt., raw decorticated cottonseed or solvent-extracted cottonseed meal was in the diets as the source of free gossypol at about the .008, .012, .016, and .020% levels. The results indicate that .016% was the lowest dietary level at which free gossypol had adverse effects on egg production and diet consumption. The wt. of the pullets was not adversely affected by free gossypol at the .020% or lower dietary levels.—*B. W. Heywang.* (Biological Abstracts)

**KAUFMAN, L., B. SWIAT-GANCARCZYKOWA, and J. BLONSKA.** Instytut Zootechniki—RNR.

A COMPARATIVE STUDY ON THE UTILIZATION OF FEED FOR EGG PRODUCTION IN GREENLEG AND SUSSEX PULLETS. *Roczniki nauk rolniczych, tom 67-B-2:* 243-256. 1954.—The purpose of the experiments reported here was to solve the problem as to whether body-weight of the birds and rate of egg output are the only factors determining the efficiency of feed utilization in respect to egg production, or whether other factors, i.e., breed differences or metabolism, are involved here.

The experiments were performed in 1949 during February, March and April and in 1950 from February till November incl. The material consisted of two pens, viz. one pen of Greenlegs and the other of Sussex, each containing from 10 to 17 pullets and a cock of the same breed. Each pen received the same weight of food (mash and grain) and green fodder. The quantity of the dry food consumed was calculated by subtracting the amount remaining in the troughs from that which had been administered. The quantity of food consumed by the cocks was calculated in relation to their body weight and subtracted from the total amount of food consumed in each pen. The efficiency of food utilization in relation to egg

production was calculated from the formula:

$$\frac{\text{Food intake in gs.}}{\text{Egg output in gs.}}$$

Lehman's coefficient of feed utilization was calculated in the experiments performed in February, March and April 1949 and 1950.

The following conclusions were reached: 1. In birds belonging to the same breed a direct positive relation exists between efficiency of feed utilization and rate of egg production. 2. The efficiency of feed utilization in relation to eggs produced was higher in the Greenlegs, unless their egg output was much lower than in the Sussex pullets. 3. During moult the quantity of food consumed in relation to body weight was the same in both breeds examined, notwithstanding the lower weight of the Greenleg pullets. 4. The breed differences in relation to efficiency of feed utilization may to a certain degree be explained by the greater ability of the Greenlegs to assimilate food components, which has been ascertained by Baczkowska and Skulmowski.

**KRATZER, F. H., D. E. WILLIAMS, BLANCHE MARSHALL, and P. N. DAVIS.** (U. California, Davis.)

SOME PROPERTIES OF THE CHICK GROWTH INHIBITOR IN LINSEED OIL MEAL. *Jour. Nutrition 52:* 555-563. 1954.—Linseed oil meal depressed the growth of chicks when fed at a level of 30% of the diet. Water treatment and autoclaving were effective in destroying the growth depressing factor while dry heat was ineffective. Linseed grits, produced with some steam treatment, were less growth depressing than old process or solvent process meal, but still responded to water treatment or pyridoxine supplementation. Aureomycin did not improve the growth of chicks fed linseed oil meal, indicating that there was no stimulation of pyridoxine synthesis by antibiotic. Single daily doses of pyridoxine given orally or injected intraperitoneally or intra-muscularly was approx. half as effective as pyridoxine in the feed in counteracting the growth inhibitor. Pyridoxine, pyridoxal and pyridoxamine were equally effective, on a molar basis, in counteracting the growth inhibitor. —*Auth.* (courtesy Wistar Bibl. Serv.).

**McDONALD, M. W., and B. W. GREENAWAY.** (Poultry Expt. Sta., Seven Hills, N.S.W.)

ARSANILIC ACID. *Agric. Gaz. N. South Wales 65:* 249. 1954.—To assess the value as a growth stimulant, of arsanilic acid (p-amino-phenyl arsonic acid), compared with penicillin in chicken rations, 2 groups of 30 White Leghorn day-old pullets were fed each of 4 diets for 5 weeks: a dry mash with: 1) added aranilic acid (4.5 g/100 lb. mash, or 90 g/T.); 2) no arsanilic acid; 3) procaine penicillin added (100 mg/100 lb. mash, or 3.2 g/T.); 4) penicillin and arsanilic acid added to mash. Penicillin alone produced 16% increase in growth. Addition of arsanilic acid did not add to increase, either alone or with penicillin.—*L. G. McNeill.* (Biological Abstracts)

**MELLEN, W. J., and F. W. HILL.** (Cornell U., Ithaca, N.Y.)

BASAL METABOLISM AND THYROID SIZE IN CHICKENS FED THIOURACIL AND A THIOURACIL-THYROPROTEIN COMBINATION. *Poultry Sci. 33:* 872-874. 1954.—Crossbred male chicks were fed a commercial ration containing either (1) 0.2% thiouracil or (2) 0.2% thiouracil plus 0.0022% thyroprotein. Detns. of basal $O_2$ consumption were made from 3 to 3.5 wks. of age. At 4 wks. all birds were sacrificed and wts. of fresh thyroids obtained. After data were adjusted for differences in body wt., chicks fed thiouracil plus thyroprotein had a slightly greater basal $O_2$ consumption than those fed thiouracil alone, but the difference was not significant. All chicks had large goiters, but those fed thiouracil plus thyroprotein had significantly larger goiters than those fed thiouracil alone. It is not clear why thyroprotein at the level used exerted an additional goitrogenic effect.—*W. J. Mellen.* (Biological Abstracts)

**MORIMOTO, H., S. ARIYOSHI,** and **H. HOSHII.**
STUDIES ON THE EFFECT OF ANTIBIOTIC SUBSTANCES ON THE GROWTH OF CHICKS. 1. ON THE MECHANISM OF THE GROWTH-PROMOTING ACTIVITY OF ANTIBIOTIC SUBSTANCES. *Bulletin of the National Institute of Agricultural Sciences,* Series G, No. 6. 1953.—Terramycin and A.P.F. feed supplement were added to the feed of chicks, and apparent growth-promoting effects of these substances were observed. After these feeding experiments, several factors were determined.

(1) Riboflavin and vitamin $B_{12}$ contents of the livers were estimated and the latter of the terramycin-supplemented and A.P.F.-supplemented groups were higher than that of non-supplemented one.

(2) Numbers of intestinal microorganism were counted. The counts of *Lactobacilli* and *yeast imperfecti* were diminished by the supplemented terramycin.

(3) Nitrogen retention has been determined over one week in each group. It was observed that the growth-promoting effect of terramycin and A.P.F. feed supplement was accompanied by the increase of nitrogen retention.

**RHODES, R. A., W. B. SARLES, W. J. MONSON, A. E. HARPER,** and **C. A. ELVEHJEM.** (U. Wisconsin, Madison.)
STIMULATION AND INHIBITION BY ANTIBIOTICS OF INTESTINAL BACTERIA IN CHICKS. *Jour. Nutrition 53:* 289-302. 1954.—Chicks were fed antibiotics in a synthetic ration which contained limiting amounts of folic acid. The numbers of bacteria in the contents of different parts of the intestines of these chicks were determined at intervals. The feeding of the antibiotics increased the growth of the chicks. The increase in growth of the chicks was accompanied by changes in the numbers of coliform bacteria and lactobacilli in the intestinal tract. The antibiotics generally increased the numbers of coliform bacteria in all levels of the intestinal tract. Aureomycin was most effective in the upper levels of the tract; a combination of bacitracin and penicillin tended to be most effective in lower levels of the tract. In contrast to their effect on coliform bacteria, the antibiotics reduced the number of lactobacilli. The bacitracin and penicillin supplement virtually eliminated the lactobacilli in the contents of all levels of the tract. Aureomycin was less effective in depressing the numbers of lactobacilli.—*Auth.* (courtesy Wistar Bibl. Serv.).

**SAXENA, HARISH C., GORDON E. BEARSE, CECIL F. McCLARY, LYNN G. BLAYLOCK,** and **LAWRENCE R. BERG.** (Washington Agric. Expt. Sta., Puyallup and Pullman, Wash.)
DEFICIENCY OF FOLIC ACID IN RATIONS CONTAINING NATURAL FEEDSTUFFS. *Poultry Sci. 33:* 815-820. 1954.—Ground milo was equal to ground corn in supporting growth of chicks when each was fed with a combination of soybean oil meal and herring fish meal. When the fish meal was the sole supplementary protein, the chicks fed corn showed poor growth and feathering, and a high incidence of perosis, but not those fed milo. The poor results on the corn-herring meal rations occurred with several samples of corn and were found to be due to folic acid deficiency. The level of folic acid required was not greater than 50 $\mu$g/100 g of ration. Five % dehydrated grass, or 2.29% brewers' yeast, or 8.33% soybean oil meal, or 2.5% liver meal were adequate to supply sufficient of the vitamin.—*H. Branion.* (Biological Abstracts)

**SCHOOP, G., WAGNER, K. H.,** and **MINNERS, P.** (Staatl. Veterinäruntersuchungsamt, Frankfurt/Main und Institut für Ernährungswissenschaft, Giessen.)
VITAMIN-A-DEFICIENCY AS A PREDISPOSING FACTOR FOR THE COCCIDIOSIS OF CHICKENS. *Monatshefte für Tierheilkunde. 6:* 154. 1954.—The influence of the Vitamin A-supply on the coccidiosis-course in chickens was tested. The results were: 1. Vitamin A-deficiency decreases the resistance against coccidiosis visible in increased mortality, in a heavier course of the disease and in a prolonged convalescence. 2. The amount of Vitamin A-supply and the severity of the disease seem to be in a direct relation. 3. The Vitamin A operates as

an anti-infective factor against coccidiosis.

Therefore the necessary conclusion is the demand for a sufficient Vitamin A-supply of the chickens during the rearing time. The supply can be managed 1.) by natural components rich in Vitamin A, 2.) by feeding synthetic preparations. The instability of the Vitamin A requires a control of the commercial preparations of Vitamin A. It is the task of the preventive veterinary medicine to care for the covering of the requirement of the growing chickens for Vitamin A.

**SCHWEIGERT, B. S.,** and **A. J. SIEDLER.** (U. Chicago.)
USE OF ANIMAL FATS IN POULTRY AND DOG RATIONS. *Jour. Amer. Oil Chemists' Soc. 31:* 52-53. Illus. 1954. (Biological Abstracts)

**SIEBURTH, J. McN., J. J. JEZESKI, F. G. HILL** (U. Minnesota, St. Paul), and **L. E. CARPENTER.** (Hormel Inst., Austin, Minn.)
SOME MICROBIOLOGICAL OBSERVATIONS ON THE ANTIBIOTIC-FED CHICK. *Poultry Sci. 33:* 753-762. Illus. 1954.—Chicks fed diets with and without antibiotic supplementation (penicillin or Aureomycin) were utilized in studies on the mechanism of growth promotion by antibiotics. Counts were made of "total" aerobes, "total" anaerobes, lactobacilli, enterococci, and coliform organisms from the feed, contents of crop, small intestine and cecum, and feces. Numbers of antibiotic resistant organisms were determined in the feces only. Respiration studies ($O_2$ consumption and $CO_2$ evolution) were made by conventional Warburg techniques on the contents of the small intestine and amine microtitrations were performed on fecal and intestinal material. In comparison with control birds receiving no antibiotics, the following observations were made on birds receiving antibiotic-supplemented diets: (a) counts on the cecal and fecal microflora do not necessarily reflect changes in the anterior segments of the intestinal tract; (b) all types of the cultivable microflora were consistently decreased in the small intestine; (c) a significant increase occurred in the proportion of antibiotic resistant aerobes in the feces; (d) decreased $CO_2$ evolution and $O_2$ consumption in the intestinal contents; (e) the odor of fecal and intestinal material was much milder and less pungent; (f) the mesenteric blood vessels along the small intestine were more prominent and dilated; and (g) decreased, but inconsistently observed, amine titrations on intestinal contents.—*J. J. Jezeski.* (Biological Abstracts)

**SLINGER, S. J.,** and **W. F. PEPPER.** (Ontario Agric. Coll., Guelph, Ontario, Canada.)
EFFECT OF PENICILLIN ON THE GROWTH AND FEED CONSUMPTION OF TURKEY POULTS. *Poultry Sci. 33:* 746-753. 1954.—Expts. were made to determine the effect of penicillin on the growth of turkey poults to 25 and 28 days of age with both free choice and equalized feed intake. The results indicate that, under the conditions employed, the mode of action of penicillin in stimulating the growth of turkey poults may be explained largely, though not entirely, on the basis of the increased feed consumption/unit of body wt. which occurs during the first wk. of life.—*S. J. Slinger.* (Biological Abstracts)

**SUNDE, M. L.** (U. Wisconsin, Madison.)
THE USE OF ANIMAL FATS IN POULTRY FEEDS. *Jour. Amer. Oil Chemists, Soc. 31(2):* 49-52. 1954.—White grease, prime tallow, and soybean oil were fed to chicks and turkey poults at the levels of 2.2-5.0%. No consistent improvement in growth was observed with chickens. A slight improvement was noted with turkeys with prime tallow. However, feed utilization was improved when the various levels of fat were fed to either chickens or turkey poults. The addition of fat to poultry feeds reduces the amount of dust and improves the texture and color of the feed.—*Auth. summ.* (Biological Abstracts)

**WAIBEL, PAUL E., H. R. BIRD,** and **C. A. BAUMANN.** (U. Wisconsin, Madison.)
EFFECTS OF SALTS ON THE INSTABILITY OF THIAMINE IN PURIFIED CHICK DIETS. *Jour. Nutrition 52:* 273-283. 1954.—

Thiamine was particularly instable in purified chick diets containing salts V. The ingredient most responsible for this destruction was $K_2HPO_4$; $CaCO_3$ and $MnSO_4$ also contributed to the instability of thiamine. The stability of thiamine was decreased further when the salt mixture was ball-milled. A new salt mixture, devoid of the 2 most deleterious ingredients of salts V, permitted thiamine stability under the conditions tested. Thiamine mononitrate was somewhat more stable than thiamine chloride hydrochloride under certain conditions, although when the destruction of thiamine was very rapid, its use was of less importance than the composition of the salt mixture. One % of glycerol reduced the disappearance of thiamine under a wide variety of conditions. On the other hand, ascorbic acid was protective only under relatively dry conditions, and in a moist environment it sometimes hastened thiamine destruction. The stability of thiamine varied widely with humidity. —*Auth.* (courtesy Wistar Bibl. Serv.).

**WILCOX, R. A., C. W. CARLSON,** and **G. F. GASTLER.** (S. Dakota State Coll., Brookings.)
THE INFLUENCE OF FORAGE JUICE, DRIED BUTTERMILK, DRIED BREWERS' YEAST AND ASCORBIC ACID ON POULT GROWTH AND BONE ASH VALUES WHEN ADDED TO A PURIFIED DIET. *Proc. S. Dakota Acad. Sci. 32*: 110-114. 1953.—Dried buttermilk, forage juice, and dried brewers' yeast used as supplements to a purified diet increased the four-week weights of poults. This purified diet was calculated to be optimum with respect to all known nutrients and to be high in productive energy. Ascorbic acid had no growth promoting effects under the conditions of these experiments and even appeared to reduce the average four-week weights slightly. The growth promoting effects of dried buttermilk and of forage juice appear to be complementary, while the growth-promoting effects of dried brewers' yeast gave only a slight increase in four-week weights when added in combination with forage juice and dried buttermilk. Forage juice may increase bone calcification slightly even though the changes made in extraction equipment make any comparisons of the bone ash data of doubtful validity.—*Auth summ.* (Biological Abstracts)

**ZNANIECKA G.,** and **T. GORSKA.** (Instytut Zootechniki RNR.)
RESTRICTION OF ANIMAL PROTEIN IN THE DIET OF LAYING HENS. *Roczniki nauk rolniczych, Tom 68-B-1:* 87-97. 1954.—One hundred and twenty laying hens selected at random were divided into two groups of four pens each.

In the diet of one animal protein fed in the form of fish meal was substituted by plant protein in the form of sunflowerseed meal. In each of the two groups the first pen received no vitamin supplement, 1% of yeast was added to the ration of the 2nd pen, the 3rd received the same amount of fish oil and the 4th both these supplements simultaneously. The substitution of the fish meal by sunflowerseed meal resulted in a decrease of egg production, egg weight and hatchability as also of hen weight.

The reduction in egg production and hen weight increase proved to be significant at the 5% probability point; the decrease in egg weight was significant at the 1% probability point.

The increase in weight in pens receiving yeast was significantly greater (at the 5% probability point).

The hatchability of fertile eggs was greater in pens receiving fish meal (64.1% vs. 48.1%). Eggs of hens fed vitamin supplements, yeast and particularly fish meal hatch much better.

**ZNANIECKA, G.,** and **H. KORZENIEWSKA.** (Instytut Zootechniki—RNR.)
DETERMINING THE PROPER CORRELATION OF PROTEIN TO CARBOHYDRATES DURING THE FIRST WEEK OF LIFE OF CHICKS. *Roczniki nauk rolniczych, Tom 68-B-1:* 99-108. 1954.—On the basis of results reached it can be concluded that feeding chicks during the first days of their life with a feed containing around 160 grams of protein per Scandinavian unit: 1) increases the weight of chicks up to the fifth week in relation to the control group receiving 80 grams of pro-

tein per Scandinavian unit, 2) does not result in any actual differences in the utilization of feed, 3) does not show a negative influence on the health of the chicks.

Due to the more rapid initial development of chicks it is recommended that feeding with a high protein content feed be begun from the first day of life of chicks.

**ZNANIECKA, G., J. WODZINOWSKI, H. CIECHANOWSKA, H. KORZENIEWSKA, and H. WECKOWICZ.** (Instytut Zootechniki—RNR.) THE EFFECT OF NETTLE MEAL ON EGG PRODUCTION AND HATCHABILITY OF HENS. *Roczniki nauk rolniczych, Tom 68-B-2:* 271-281. 1954.—A diet containing 5 g. of nettle meal, prepared from young plants was fed during the winter months to laying hens and compared to an otherwise similar diet containing 5 g of alfalfa meal.

The average egg production of hens given nettle meal during the 98 day experimental period was 51.9 eggs as against 48.6 eggs in the case of hens given alfalfa meal.

This small difference in the egg production did not prove to be significant.

The average weight of eggs was somewhat lower (55.7 g vs. 56.8 g). The weight increase of hens given nettle meal was greater and reached 88.5 g per hen vs. 32.7 g in the case of hens given alfalfa meal. This was found to be significant at the 5% probability point.

Nettle meal did not show any apparent effect on the fertility of eggs. Hatchability of the fertile eggs from the eleven secured hatches was better in the nettle meal group.

The addition of nettle meal to the diet of laying hens appeared therefore to be suitable and can be recommended in feeding practice.

## PATHOLOGY

**ANCZYKOWSKI, F.** (Panstwowy Instytut Weterynaryjny—RNR.) FOWL BRUCELLOSIS. II RESULTS OF SEROLOGICAL STUDIES ON FOWL SERUM OBTAINED FROM LOWER SILESIA. *Roczniki nauk rolniczych, Tom 66-E-3:* 303-317. 1954.—Mass examinations were carried out on *Brucella* bacteria infection by means of agglutination tests with fowl serum from Lower Silesia.

Of the 29 examined hen populations (2334 individuals) 25 populations (86.2%) showed a positive reaction (1:25 or higher). As concerns turkeys, 41.3% of the 46 birds examined proved to be infected.

The percentage of positively reacting birds in different populations was not the same: in 10 populations (34.8%) 1-5 of the birds showed a positive reaction, in 3 populations (10.4%)—6-10%, in 10 populations (34.8%—11-20%, in 1 population (3.5%)—and in 1 population (3.5%) —55.5%.

These various percentages in the reaction of birds in farms to agglutination tests show that specific groups were in various stages of infection and can also be proof of a various course of infection in respect to its intensity and duration.

Milk from infected cows or from dairies was probably the source of infection.

Fowl brucellosis seems to possess a great epizootical and economic significance in Poland.

It is necessary to extend examinations to include all farm animals, people and eventually wild animals in order to determine their role in contracting the disease, transporting the germ as also to determine the character and extent of damages resulting from brucellosis infection. Determining the general degree of infection with *Brucella* is most important in epizootiological examinations; intensity of changes and the number of individuals reacting positively requires a critical consideration of individual characteristics, conditions of the environment and biological properties of infection of poultry with *Brucella* bacteria. A small number of individuals reacting positively at a given time of examination by no means indicates that the intensity of brucellosis infection in a given population was always small and that in such cases fowl

brucellosis is economically insignificant.

Agglutin titration of 1:10 and higher was found only in individuals of such groups in which agglutination tests with *Brucella* was positive.

It is necessary to improve the technique of performing agglutination tests and to determine common criteria for evaluating results of such tests.

**ANCZYKOWSKI, F.** (Panstwowy Instytut Weterynaryjny—RNR.)
FOWL BRUCELLOSIS III. REACTION IN AGGLUTINATION TESTS OF SERUM OF FOWLS INFECTED IN NATURAL CONDITIONS SIMULTANEOUSLY WITH *S. PULLORUM* AND *BR. ABORTUS. Roczniki naukrolniczych, Tom 66-E-3:* 319-325. 1954.—Results of serological examinations (with the use of agglutination tests) of the blood serum of 28 populations of hens with suspensions of *Br. abortus* and *S. pullorum* were analyzed by applying statistical methods for the purpose of proving whether a regularity exists in the appearance of anti-*Brucella* and anti-*S. pullorum* agglutination in cases of natural mixed infection.

It was not possible to detect any correlation between positive and negative results of agglutination tests with *Br. abortus* and *S. pullorum* suspensions. The results as a whole suggest specificity of the tests.

**BODON, L., and M. SZENTIVANY.**
INTERFERENCE PHENOMENA BETWEEN DIFFERENT FOWL PEST VIRUSES IN EMBRYONATED HEN EGGS. (INTERFERENCIA-JELENSEG FIASITOTT TYUKTOJASBAN KULONBOZO BAROMFIPESTIS-VIRUSOK KOZOTT.) *Magyar Allatorvosok Lapja, Budapest. 11:* 325-330, 1953. *(Hungarian Agricultural Review. 3(2):* 21, 1954).—The authors investigated interference phenomena between the H (Hertfordshire) and L (Lederle) fowl pest virus strains of low virulence and a virulent strain of fowl pest (Newcastle-disease) virus isolated from an outbreak in the field.

In every case, the virus suspensions were injected into the allantois cavity, the street virus being introduced partly simultaneously with the H and L strains and partly at various intervals (3 to 27 hours) after the injection of the two above strains. The appearance of the virus was detected by the maemagglutination test. The identification of the virus strains was made by chicken infection tests.

The injection of H virus 6 hours, and that of L virus 3 hours before the street virus, inhibited the propagation of the latter into the amnionic liquor.

The above phenomenon can be attributed to the different multiplication rate of the various strains in the embryonated hen eggs. The stronger interfering properties of the L virus may also be explained in the same way.

**BROADFOOT, D. I., B. S. POMEROY** (U. Minnesota, St. Paul), **and WADE M. SMITH, JR.**
EFFECTS OF INFECTIOUS BRONCHITIS ON EGG PRODUCTION. *Jour. Amer. Vet. Med. Assoc. 124(923):* 128-130. 1954.—Following an outbreak of infectious bronchitis involving 14,000 3-7 day old chicks in 35 flocks with a mortality of 5-35%, on reaching 7 mo. age the survivors averaged 50% egg production instead of expected 70-80%. Culling was unsatisfactory and trapnesting revealed birds visiting nests but not laying. These false layers were found to have active ovaries but abnormal oviducts. These chickens were derived from one hatchery over a two-wk. period and differed from normally producing flocks only in the bronchitis infection as chicks.—*J. F. Ryff.* (Biological Abstracts)

**CLARK, D. S., E. E. JONES, W. B. CROWL, and F. K. ROSS.** (California Dept. Agric., Sacremento.)
ASPERGILLOSIS IN NEWLY HATCHED CHICKS. *Jour. Amer. Vet. Med. Assoc. 124(923):* 116-117. 1954.—Study of 26 broods on 21 ranches involving 210,000 chicks from one hatchery indicated 1-10% mortality from aspergillosis prior to 10 days of age. Of the 26 broods, 22 revealed bronchial plugs (in 8 as the only lesion); 8 aspergillosis nodules in the respiratory tract; 10, bronchial plugs and yellow pus in

the lungs or air sacs. Generally, the bronchial plugs were observed in chicks under 5 days with other involvement showing up later. Aspergillus was isolated from the brain of one chick with nervous symptoms. Inoculation of chick embryos failed to disclose a virus. Eggs from the hatchery's flocks failed to reveal mycotic infection, but *A. fumigatus* was readily recovered from the hatchery premises. Dismantling of equipment and disinfection were necessary to eliminate the infection. *J. F. Ryff.* (Biological Abstracts)

**ELEK, P., and SZENT-IVANYI, M.**
NEW METHODS OF ACTIVE IMMUNZATION AGAINST FOWL CHOLERA. [UJ EIJARASOK BAROMFICHOLERA ELLENI AKTIV IMMUNIZALASRA.] *Magyar Allatorvosok Lapja, Budapest,* 1954. 110-113.—The authors give a review of the methods of active immunization against pasteurelloses and especially fowl cholera with special reference to an adsorbed concentrated vaccine used in Hungary recently.

On the basis of Carter's publications the authors investigated vaccines prepared from bacteria cultured in embryonated hen eggs. In experiments on chickens and mice the experimental vaccines had only a tenfold protective value as compared to untreated controls. These results are less favorable than those of Carter but twice as good as those obtained with the adsorbed vaccine now in use.

**FRITZSCHE, K.** (Landes-Veterinäuntersuchungsamt Rheinld. Pfalz, Koblenz.)
EXPERIENCES OF THE VETERINARY ACTIVITY IN CASE OF FOWL. *Berliner u. Münchener Tierärztliche Wochenschrift, Nr. 19:* 313. 1954.—The author tries to give some hints to the veterinary doctor for the practice with fowl, thus facilitating his work. As there is, as a rule, a treatment of flocks, the author refers to the special responsibility arising out of this fact. The author points out the increasing importance of the diseases of fowl for the veterinary medicine and the obligation to call special attention to this sector more than before in the studies of veterinary doctor.

**FRITZSCHE, K.** (Landes-Veterinäruntersuchungsamt Rheinld. Pfalz, Koblenz.)
TESTS CONCERNING THE CONTROL OF CECAL COCCIDIOSIS IN CHICKENS BY SULFONAMIDES AND NITROFURAZONE. *Archiv für Geflügelkunde. 18:* 228. 1954.—At first a short consideration of the hygienic measures to be taken in connection with the application of coccidiostatica is given. The experiments, testing the efficiency of the sulfonamides (Methyl-Debanal, Supronal, Gantrisin, Sulfaquinoxaline) as well as Nitrofurazone and 13152 against coccidiosis of chickens were practical field trials. They nearly all were accomplished on a large poultry farm, so there was a good possibility to compare the efficiency of the different preparations which were tried with 10,200 chickens within two years. The value of the various preparations could be tested very well by the fact that mass infections of coccidiosis occurred in some of the chicken groups. At this occasion it could be confirmed that both Methyl-Debanal and Supronal were well suited for the therapy of sickened lots. Gantrisin and Nitrofurazone also were of very good value in the therapy. As prophylaxis Sulfaquinoxaline, Nitrofurazone besides Nitrophenide are well adapted for a permanent application during the rearing-time. An experiment on a large scale with prophylactic dosage of Sulfaquinoxaline in chicken-rations, tried in Western Germany in 1953, turned out very satisfactory.

**GOETZ, M. E., E. R. QUORTRUP, and J. W. DUNSING.**
INVESTIGATIONS OF ARIZONA PARACOLON INFECTIONS IN POULTS. *Jour. Amer. Vet. Med. Assoc. 124:* 120-121. 1954.—Use of an Arizona paracolon plate antigen disclosed 6 reactors (from 5 of which Arizona paracolon organisms were recovered on necropsy) in 1414 turkeys but 2 subsequent tests remained negative after their disposal. In several lots of eggs from reactor hens in another flock, of 157 eggs only 34 healthy poults were secured and infertile eggs or dead embryos ac-

counted for most of the remainder with 18 recoveries of the organism. In a second lot, similar results were secured and when 32 surviving poults were killed on the 22d day, 9 were infected. Eggs from infected hens from a 3d group resulted in 52 apparently healthy poults hatched from 80 eggs but 45 had died by the 12th day with recovery of the organism from all. Better livability was secured with a 2d group when incubator fumigation was practiced, but, when 42 were killed on the 23d day, 32 were found infected.—*J. F. Ryff.* (Biological Abstracts)

**GRUMBLES, L. C., F. K. WILLS,** and **W. A. BONEY, JR.** (Texas A. and M. Coll., College Station.)
FURAZOLIDONE IN THE TREATMENT OF FOWL TYPHOID IN TURKEYS. *Jour. Amer. Vet. Med. Assoc. 124:* 217-219. 1954.—Furazolidone fed in the feed at levels of 0.011% and 0.0055% was found to be effective in preventing mortality associated with fowl typhoid (*Salmonella gallinarium*) infection in turkeys. The higher level of 0.011% was found more effective in severely infected birds. No evidence of toxicity or unpalatability was encountered. Exposed and treated birds were shown susceptible to reinfection and to be carriers of *S. gallinarum.—Auth. summ.* (Biological Abstracts)

**HUTT, F. B.,** and **COLE, R. K.** 1954. (Cornell Univ., Ithaca.)
PROBLEMS CONCERNING LEUCOSIS AND ITS CONTROL. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], *1954:* 197-201.—The main factors affecting resistance to lymphomatosis (the genetic constitution of the birds, their age at exposure, and the severity of the exposure) are reviewed and discussed. In 2 resistant lines bred at Cornell mortality due to leucosis averaged only 4.6% over a 5-yr. period compared with a mortality rate of 50.7% in a strain bred for susceptibility. Observations on resistant stock transferred to other localities indicate that genetic resistance established in one locality is maintained elsewhere. A combination of the 2 main methods of control (*i.e.* genetically resistant stock not exposed to infection until 160 days of age) entirely eliminated deaths from lymphomatosis. (Animal Breeding Abstracts)

**KLIMES, B.** (Agricultural University, Brno, Czechoslovakia.)
TO THE DEHELMINTISATION WITH BENZINE. [POZNAMKA K DEHELMINTISACI BENZINEM.] *Veterinarstvi 1954, IV, 9:* 268-269.—With the eating of the repelled ascaridia after the dehelmintasitation there is no danger for the poultry of the reinfection. The parasites are destroyed in the goiter and the stomach. To protect the poultry against the parasites it is possible to apply hemin in the evening and repelled ascaridia may be removed early in the morning. We do not recommend to use tetrachlorethylen in the evening, as there is the dangr of narcotisation. *(V. Orel)*

**PIWOWARCZYK, S.** (Panstwowy Insytut Wterynaryjny—RNR.)
INOCULATION OF FOWL AGAINST TUBERCULOSIS WITH AVIAN TUBERCULOSIS STRAINS INACTIVATED BY HIGH TEMPERATURE. *Roczniki nauk rolniczych, Tom 66-E-1:* 85-90. 1953.—The author immunized hens against tuberculosis using vaccine prepared by inactivating B. tuberculosis by the action of heat—70°C. for ½ hour. The following results were obtained. Hens inoculated 5 times subcutaneously with a dose of 5 mg were immune to subcutaneous introduction of 2 mg of virulent bacteria. The immunization lasted 10 months. Hens inoculated twice subcutaneously with 5 mg, infected through the digestive tract with 4 mg of virulent strain showed the following after being kept in a flock 6 months. Of 20 immunized birds 4 showed tuberculosis together with all 3 control hens. 20 hens inoculated twice with 4 mg of vaccine and 3 control birds were kept with a Tbc hen 4 months and killed (after 8 months). They did not show any tuberculosis lesions while in two of the 3 control birds tuberculosis lesions appeared.

**RICHTER, F.** 1954. (Inst. Phys. Res., Res. Centre Agric., Brunswick- Volkenrode.)
EXPERIMENTS TO ASCERTAIN THE CAUSES OF FEATHER-EATING IN THE DOMESTIC FOWL. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 258-262. (Animal Breeding Abstracts)

**RIEDEL, BERNARD B.** (Mississippi Expt. Sta., State College.)
THE RELATIONSHIP OF GLYCINE TO THE RESISTANCE OF CHICKENS TO THE ROUNDWORM, ASCARIDIA GALLI. *Poultry Sci. 33:* 742-746. 1954.—A diet inadequate in glycine content retarded the growth of New Hampshire chicks. Adequate glycine did not correlate with increased resistance to the roundworm, *Ascaridia galli.* Chickens fed a glycine supplemented diet harbored about the same numbers but significantly longer ascarids than did hosts fed an inadequate glycine diet.—*B. B. Riedel.* (Biological Abstracts)

**SCHLUTTER, H.** (Lehr- und Versuchsanstalt für Geflügelzucht, Krefeld-Grosshüttenhof.)
RESEARCH CONCERNING THE BACTERIUM PULLORUM PROBLEM IN PRACTICAL POULTRY BREEDING? BASED ON LITERATURE UP TO DATE AND OWN TESTS AT THE POULTRY EXPERIMENTAL FARM KREFELD-GRO: HUTTENHOF. *(Archiv für Geflügelkunde. 18:* 341. 1954.—A summary is given concerning the literature dealing with Pullorum disease up to date. Then tests are described conducted during 2½ years with a large number of birds to show to the poultry breeder once more the importance of the rapid blood tests as the only possible method to control pullorum disease. The most important results were: 1. It is not possible to determine all infected birds by the stained-antigen rapid whole-blood test and the serum tube test. A second or third testing of the whole flock will be necessary in severe cases of the disease. 2. The rapid whole-blood test is more suitable especially if several examinations of the flock are necessary. There are only few differences between the two methods. 3. Although changes from positive to negative reaction may occur with one bird, each hen reacting positive once, is a carrier and has to be removed. 4. The eggs of positive reacting birds should not be used for reproduction. Only relative few eggs may carry the agent over to the chickens. These few carriers, however, are already able to cause an epidemic outbreak of the disease. 5. The transmission of the disease from one bird to another one and the infection of whole flocks by infected soil are to be observed carefully.

**TAKAGI, G.** (Koyoto U.)
STUDIES ABOUT BERIBERI-ALLERGY, WITH SPECIAL REFERENCE TO THE INFLUENCE OF SEVERAL MEDICAMENTS UPON THE CARDIOVASCULAR SYSTEM OF CHICKENS SUFFERING FROM RICE-DISEASE. II. SUMMARIZED OBSERVATION. (ESPECIALLY ABOUT MICROSCOPIC FINDINGS). *Japanese Jour. Constitutional Med. 19:* 36-53. 1954.—Using 25 chickens suffering from rice-disease, several medicaments such as antihistaminics, suprarenal cortex hormone (Rindex) were injected into them to discover their influence upon the suffering. The results were as follows: Many rheumatic and rheumatoid nodules were found around the small arteries of the heart in addition to several other allergic changes such as allergic angitis likely to periarteritis, pericarditis, myocarditis, hydropericardium, etc. After electrocardiographic observation, myodegeneratio cordis was found in the very early stage of the suffering. As an antihistaminic, Rindex was considered to be most excellent to prevent the appearance of several allergic changes and to prolong the life duration of the chicken. —*K. Suzue.* (Biological Abstracts)

**WILLEMS, A., F. VANSCHOUBROEK, and R. VERCRUYSSE.** (University of Ghent, Belgium.)
DE PROPHYLACTISCHE WERKING VAN NITROPHENIDE TEGEN E. TENELLA-INFECTIE BUJ KUIKENS. *Vlaams Diergeneeskundig Tijdschrift. 24:* 113-119. 1955.—The prophylactic activity of nitrophenide against E. tenella infection was tested in an experiment in which all circumstances were very much alike those that occur under natural infection in the field.

We used a total amount of 364 three weeks old White Leghorn chicks subdivided into 4 groups, 48 of them were artificially infected with 2,500 sporulated oocysts of E. tenella and served the purpose of contaminating the litter.

Every week a lot of clean chickens were added to the various groups. The contaminator groups were supplied with nitrophenide-free feed during the first 8 days. Afterwards nitrophenide was administered to groups 1, 2, 3 and 4 at a level of 0, 250, 400 and at alternative days 400 gr. and 0 gr. pro Ton respectively.

The results indicate that mortality was strongly reduced by nitrophenide at the level of 0.025 per cent and was even further decreased by the 0.04 per cent concentration. Nevertheless the latter concentration gave only partial protection when the litter became too heavily contaminated. Intermittent administration of 400 gr. and O. gram nitrophenide pro Ton gave nearly identical results as the continuous administration of 250 gram pro Ton.

Although only one result proved statistically significant we found that three weeks after their arrival in the various groups the body weight of the chicks was higher in the groups with nitrophenide, administered at the three levels mentioned, than in the control. No difference however was recorded in and between these three groups.

**ANONYMOUS.**

OBSERVATIONS ON HEMORRHAGIC DISEASE OF BROILERS. *Feedstuffs 26(27):* 33-38. 1954.—This is a complex problem. Symptoms usually include hemorrhages of some type, and may include abnormalities of the bone marrow, variable blood-clotting time, or anemia. Blood clotting and prothrombin times are not reliable diagnostic features of the hemorrhagic syndrome. Infectious diseases may "trigger" the symptoms. Mild diagnoses of coccidiosis may be made. Injuries may cause similar hemorrhages. Field experience with vit. K admn. was variable. In some cases vit. K seems effective, while in others the syndrome has appeared when birds were fed diets supplemented with menadione. Caution must be used in applying the results of laboratory work with K deficiencies to field conditions. Coccidiostatic drugs were not found to produce these symptoms when used properly. There is a possibility of a direct relationship between hemorrhagic disease and the organisms associated with chronic respiratory disease.—*H. L. Wilcke.* (Biological Abstracts)

## POULTRY PRODUCTS AND MARKETING

**BEISEL, C. G.**

HI-VAC UPS OUTPUT. *Food Engineering 26(7):* 60-61. 189. 1954. —A method is described for rapid cooling of cooked fowl by application of vacuum.—*J. J. Licciardello.* (Biological Abstracts)

**BISHOV, S. J.,** and **J. H. MITCHELL, JR.** (QM Food and Container Inst., Chicago.)

DETERMINATION OF THE SOLUBILITY INDEX OF SPRAY DRIED EGGS. *Food Res. 19:* 367-372. 1954.—A rapid and reproducible method for determining the solubility of spray dried whole egg powder is described. The method involves 4 main steps: a) Dispersion of egg solids in 0.9% saline solution. b) Centrifugation of saline-insoluble solids. c) Precipitation of saline-soluble and colloidal fraction with Esbach reagent. d) Centrifugation of Esbach-precipitated solid and reading the volume of the precipitate in milliliters to the nearest tenth, as solubility index.—*Authors.* (Biological Abstracts)

**BRANT, A. W.,** and **NORRIS, K. H.** 1954. (Agric. Res. Serv., Beltsville, Md.)

MECHANISING THE DETERMINATION OF QUALITY OF SHELL EGGS. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 335-338.—As candling is now considered to be a relatively inaccurate method of assessing egg quality, attempts have been made to use mechanical devices instead. A brief account is given of the determination of certain quality factors by mechanical and automatic means. These factors are: egg size, egg shape, cracks, shell strength, shell colour, air-cell size, presence of blood, *Pseudomonas* rots, and yolk colour. No satisfac-

tory method has yet been evolved for determining albumen condition, but various investigations are in progress.—*A.P.G.* (Animal Breeding Abstracts)

**BROOKS, J.** (U. Cambridge and Dept. Sci. Ind. Res., Cambridge.)
THE FLUORESCENCE OF LIQUID EGG. I. THE RELATION BETWEEN THE FLUORESCENCE AND MUSTINESS OF FROZEN WHOLE EGG. *Food Technol 8:* 400-405. 1954.—There was no significant difference between the fluorescence of a clear serum extracted from normal samples and from musty samples of frozen whole egg when the fluorescence was measured at a fixed pH. When the serum was treated with sodium hydrosulfhite under standard conditions, the fluorescence of the serum from normal material decreased and the fluorescence of the serum from defective material increased. The extent of the increase of fluorescence was related quantitatively to the intensity of mustiness in the original frozen egg.—*Author.* (Biological Abstracts)

**BROWN, HELEN J.,** and **N. E. GIBBONS.** (Natl. Res. Lab., Ottawa, Canada.)
AIR CELL MOLD IN OILED EGGS. *Food Technol. 8:* 307-311. 1954.—The development of air cell mold in oiled eggs could not be related to external factors such as handling methods, local conditions or storage temp. *Penicillium expansum, Cladosporium herbarum* and *Sporotrichum carnis* were most commonly found. Using these 3 molds, it was shown that $CO_2$ concns. up to 10% stimulate mold growth on egg albumen, on air cell membranes floating on albumen, and on carbonate agar. On all 3 media the $CO_2$ reduced pH to levels more favorable for growth. Low $O_2$ concns. produce flat pale colonies typical of air cell mold. Oiling seals the shell allowing accumulation of $CO_2$ which lowers the pH and stimulates germination of spores. The growth is self-limiting owing to depletion of $O_2$ in the air cell by the developing mold. (Biological Abstracts)

**COTT, HUGH B.** (U. Cambridge, Eng.)
THE PALATABILITY OF THE EGGS OF BIRDS: MAINLY BASED UPON OBSERVATIONS OF AN EGG PANEL. *Proc. Zool. Soc. London 124:* 335-457. 1954.—The palatability of the eggs of 212 spp. of birds belonging to 25 orders was tested by a panel composed of several tasters. The eggs were rated on an acceptability scale ranging from 8.7 for the domestic fowl to 2.0 for *Parus n. niger,* the Black Tit.—*A. O. Weese.* (Biological Abstracts)

**DHYSE, FREDERICK G.** (Natl. Cancer Inst., Bethesda, Md.)
A PRACTICAL LABORATORY PREPARATION OF AVIDIN CONCENTRATES FOR BIOLOGICAL INVESTIGATION. *Proc. Soc. Exptl. Biol. and Med. 85:* 515-517. 1954.—Avidin concentrates are prepared by precipitation of the active fraction during a dialysis (in distilled water) of a 1% saline extract of an acetone coagulation of dried egg white solution at pH 5.1. The activity of these preparations (1.5 units/mg) averages 20% that of "pure" (8.0 units/mg) avidin, and the yield is about one g of such material from 800 g of dried egg white. The avidin activity is determined by microbiological assay with *Saccharomyces cerevisiae* ATCC-9896 from American Type Culture Collection, Washington, D.C.—*F. G. Dhyse.* (Biological Abstracts)

**ESSELEN, W. B.,** and **A. S. LEVINE.** (U. Massachusetts, Amherst.)
BACTERIOLOGICAL INVESTIGATION OF FROZEN STUFFED POULTRY. *Jour. Milk and Food Technol. 17:* 245-250, 255. 1954.—The aerobic and putrefactive anaerobic bacterial counts showed no appreciable changes in stuffed chickens stored for 12 months at -10°F. These organisms increased very rapidly when the chickens were held at room temperature up to 20 hours. An increase in acidity and the development of off-odors was evident during this period. Packaging material appeared to have no significant effect on bacteria content of the dressing. Spores of a putrefactive anaerobe inoculated into the stuffing prior to freezing showed no evidence of germination and growth under these conditions.—*H. H. Weiser.* (Biological Abstracts)

**HALL, C. W., and L. E. Dawson.** (Michigan State Coll., East Lansing.)
OBSERVATIONS ON THE COOLING RATE OF EGGS. *Poultry Sci. 33:* 919-924. Illus. 1954.—A series of experiments was designed to furnish basic information on egg cooling rates using a commercial (experimental model) egg cooler, and to associate these cooling rates with changes in egg quality. Eggs of known and controlled history were held in the cooler in different containers for periods up to 21 days. Cooling costs were also obtained. Temperatures were measured by means of a 10-point potentiometer. The cooler operated at a temperature of 58°F ± 3° and 70-90% R. H. It took from 1½ hours to 48 hours to cool eggs from 78°F to 60°F, depending upon containers used. The cooling curve was similar for eggs with different initial temperatures with an average cost of 0.6 cent per doz. Use of ventilated fillers and flats and also air in motion speeded cooling.—*L. E. Dawson.* (Biological Abstracts)

**HANSON, HELEN L.,** and **LEO KLINE.** (Agric. Res. Serv., U.S. Dept. Agric., Albany, Calif.)
CONSUMER-TYPE APPRAISAL OF WHOLE EGG POWDERS STABILIZED BY GLUCOSE REMOVAL (YEAST FERMENTATION) AND BY ACIDIFICATION. *Food Technol. 8:* 376-372. 1954.—Relative preference for whole egg powder stabilized by glucose removal and by acidification was determined for groups of 40 individuals by paired preference and hedonic-scale tests. Tests showed little difference in acceptability of the 2 types of eggs compared as scrambled eggs immediately after dehydration. During storage at 100°F there was an increasing comparative preference for scrambled eggs prepared from glucose-free powder, which was related to their superior stability.—*H. L. Hanson.* (Biological Abstracts)

**HARNS, J. VIVIAN, E. A. SAUTER, BARBARA A. McLAREN** and **W. J. STADELMAN.** (State Coll. Washington, Pullman.)
THE EFFECT OF SEASON, AGE, AND STORAGE CONDITIONS ON THE FLAVOR OF EGGS AND PRODUCTS MADE USING EGGS. *Poultry Sci. 33:* 992-997. 1954.—Observations were made on flavor of angel food cakes, custards, poached eggs and eggs cooked in the shell. Eggs used for these products were produced from hens of 2 breeds fed 2 different diets. Season of production resulted in only a slight change in flavor. Eggs produced during the winter months maintained better flavor during storage at 72°F than did eggs produced during the summer months. Eggs placed in cold storage (32°F.) maintained flavor for periods up to 4 months. Oil treating of the shells did not maintain the flavor attributes of the egg. The flavor of eggs was apparently maintained primarily by low temperature. The egg flavor of untreated eggs held for 4 months at 32°F. was comparable to the flavor of eggs held for 3 weeks at 72°F. The breed or feed did not influence the flavor of fresh eggs when used in the 4 test products.—*W. J. Stadelman.* (Biological Abstracts)

**HARNS, J. VIVIAN, E. A. SAUTER, BARBARA A. McLAREN** and **W. J. STADELMAN.** (Washington Agric. Expt. Sta., Pullman.)
A COMPARISON OF SEVERAL METHODS FOR EVALUATION OF QUALITY IN EGGS. *Poultry Sci. 33:* 1022-1028. 1954.—Various methods for evaluation of physical quality of raw eggs and their functional and flavor properties were compared. Simple correlations between methods were calculated. All correlations were obtained using the same eggs for physical and culinary measures. Albumen index was correlated with other quantity measurements on eggs except yolk color. Various methods tested for evaluation of quality in angel food cakes were all highly correlated. Quality measures of custard, with the exception of texture, were correlated with raw egg quality and with each other. Flavor attributes of poached eggs were correlated with physical measurements of egg quality. Foam drainage was not related to egg quality under the conditions of this experiment.—*W. J. Stadelman.* (Biological Abstracts)

**HIXON, RAYMOND, R. J. CONNOLLY,** and **GEORGE F. STEWART.** (U. California, Davis.)
DETECTION OF WASHED EGGS BY CONDUCTIVITY MEAS-

UREMENTS. I. TEST METHODOLOGY. *Food Res. 19:* 417-423. 1954. —A test was devised for detecting washed eggs, using the conductance of aqueous shell extract as a criterion. Details of apparatus and procedure are given. Overlapping conductivity distribution curves for washed and unwashed eggs prevent precise discrimination; however, tolerable errors were encountered when 0.24 mv was used as dividing point. Field tests of method are to be reported later.—*Authors.* (Biological Abstracts)

**HIXON, R. R., and G. F. STEWART.** (U. California, Davis.)
DETECTION OF WASHED EGGS BY CONDUCTIVITY MEASUREMENTS. II. FIELD TESTING. *Food Technol. 8:* 422-424. 1954.—Field tests were made of the conductivity test (previously described) for detecting washed eggs. Approximately 550 washed and unwashed eggs from 20 ranches were tested. Accuracy of detection approximated 85%.—*Authors.* (Biological Abstracts)

**KLINE, LEO, T. T. SONODA, and HELEN L. HANSON.** (Agric. Res. Serv., U.S. Dept. Agric., Albany, Calif.)
COMPARISONS OF THE QUALITY AND STABILITY OF WHOLE EGG POWDERS DESUGARED BY THE YEAST AND ENZYME METHODS. *Food Technol. 8:* 343-349. 1954.—Enzyme-and yeast-desugared whole-egg solids are examined by chemical methods for changes induced by processing. The comparative initial qualities of the 2 powders were determined by baking performance, trained-panel evaluation, and consumer-type preference testing. The relative stabilities of the 2 powders were appraised by the same methods after storage at 100°F.—*Leo Kline.* (Biological Abstracts)

**MILLER, W. A.** (Kansas State Coll., Manhattan.)
THE MICROBIOLOGY OF DIRTY EGGS TREATED IN VARIOUS WAYS AND STORED AT DIFFERENT TEMPERATURES AND HUMIDITIES. *Poultry Sci. 33:* 735-742. 1954.—The data tabulated during this investigation based on bacteriological analyses of 5,274 eggs indicates that washing dirty eggs in water, a detergent, or a combination of washing and treatment with sodium hydroxide, "Roccal," lactic acid, or sulfurous acid, is no more effective in preventing penetration and growth of spoilage bacteria at a given storage temperature, than storing the eggs dirty or hand buffing them with sandpaper. Eggs thermostabilized or pasteurized showed a lower percent containing significant numbers of spoilage bacteria compared with chemically treated eggs in the same group. Organoleptic observations on broken-out eggs indicated that plate counts greater than 10 million per ml were frequently associated with off odors, while eggs yielding counts below 10 million per ml usually had no detectable abnormal odors. A few eggs containing must type organisms similar to *Pseudomonas graveolens* manifested unpleasant odors, even though plate counts were below 10 million per ml.—*W. A. Miller.* (Biological Abstracts)

**MILNE, F. N. J.**
THE EFFECT OF BENZENE HEXACHLORIDE IN POULTRY FEED ON MEAT AND EGG QUALITY. *Queensland Journal of Agricultural Science 10:* 214-221. 1953.—A commercial form of benzene hexachloride dust (12.5% gamma isomer) and a deodorized form (99% gamma isomer) were each fed to poultry in all-mash ration at levels equivalent to 5 p.p.m. and 25 p.p.m. of the gamma isomer to study the effect on meat and egg quality.

Groups of 20 cockerels were fed treated mashes from 12 weeks of age. The flesh was found to be tainted within 5 weeks in the group fed commercial BHC at 25 p.p.m. gamma isomer and within 7 weeks in the group fed 5 p.p.m. gamma isomer. No taint was found in groups fed deodorized BHC after 16 weeks' continuous feeding, when the experiment on flesh quality ended.

Groups of 20 pullets were fed treated mashes from 6 months of age. Taint was detected in eggs of the pullets fed mashes treated with commercial BHC after 4 weeks of feeding at the 5 p.p.m. level. In the two groups fed deodorized BHC, at 25 p.p.m. and 5 p.p.m., eggs were

tainted 16 and 18 weeks respectively after feeding.

It is concluded that neither commercial BHC nor deodorized BHC should be used to control weevil infestation in grains destined for poultry feeding.

**MUNDT, J. O., R. L. STOKES,** and **O. E. GOFF.** (U. Tennessee, Knoxville.)

THE SKIN OF BROILERS AS A BARRIER TO BACTERIAL INVASION DURING PROCESSING. *Poultry Sci. 33:* 799-802. 1954.—Relatively few bacteria were recovered from the body cavities of broilers 4 hours after chilling, and practically all body cavities were sterile when undrawn broilers were refrigerated for one or more days. Results were not influenced by extreme variations in temperature of scalding fluid or of chilling media, in various combinations. Muscle tissues from which the skin had been stripped were generally sterile, although the numbers of bacteria on the skin and in the cooling fluid increased with holding. Two species of motile bacteria, *Pseudomonas aeruginosa* and *Serratia marcescens*, did not penetrate the skin when portions were used as membrane barriers between inoculated and uninoculated broths. It is concluded that bacteria do not penetrate the skin barrier during processing and normal chilling and refrigeration of undrawn poulty, nor do they penetrate the intestinal wall, during the time intervals and the conditions used.—*Auth. summ.* (Biological Abstracts)

**MUSIL, F.** (Research Institut for Milk and Egg, Prague, Czechoslovakia.)

OLEJOVANI, THERMOSTABILISACE A OSETRENI VAJEC UMELYMI PLASTICKYMI HMOTAMI. [THE OILING, THERMOSTABILIZATION AND THE TREATMENT OF SHELL EGGS WITH PLASTICS.] *Prumysl potravin, 1954, V, 10:* 457-60.—The review of experiences with the oiling, thermostabilization and treatment with plastics of shell eggs mentioned in literature. The author reports his own experiences with oil thermostabilization. The changes of pH value not only depends upon the treatment and time of storage, but mainly on the age of eggs. The pH value of egg white of eggs treated and stored 14 days after laying diminished during 6 months of storage in cold storage in untreated from 9.55 to 9.10 and in oiled from 9.55 to 9.00, but in thermostabilized from 9.55 to 8.85. In eggs treated and stored 7 days after laying during this period of cold storage pH value of egg white diminished in untreated eggs from 9.25 to 9.30, in oiled from 9.25 to 8.95 and in thermostabilized from 9:30 to 8:80. In eggs treated and stored 24 hours after laying during this period of cold storage in untreated eggs pH of egg white increase from 8.85 to 9.35 and in oiled and thermostabilized diminished from 8.85 to 8.50.

From his results the author concludes that oiling and thermostabilization of fresh eggs guarantees a much more favorable pH value of eggs during cold storage. Further he found an increase of the egg white index provoked by thermostabilization in comparison to the initial value already in eggs 48 hours after laying. *(V. Orel.)*

**SHRADER, H. R.** (U.S. Dept. Agric.)

EGGS NOW GET AN I.Q. RATING. *Amer. Egg and Poultry Rev. 16(5):* 4-4, 36-37. 1954.—A review of tests used to check on quality of eggs is given. Illustrations show instruments used to measure shell thickness, yolk and albumin height on brokenout eggs.—*H. G. Lindquist.* (Biological Abstracts)

**SWICKARD, MARY T.,** and **ALICE M. HARKIN.**

PERCENTAGE RELATIONSHIPS OF RAW CARCASS WEIGHTS AND YIELD OF COOKED PORTION OF YOUNG BELTSVILLE SMALL WHITE TURKEYS. *Poultry Sci. 33:* 775-779. 1954.—Yields were calculated for turkeys of 2 age classes, fryers or roasters and young toms, all of the same breed and raised on the same standard diet. Toms 26 weeks old had a significantly higher percentage of dressed weight than toms 14 weeks old and hens 16 weeks old. Percentage yield of ready-to-cook weight without giblets and neck for toms 26 weeks old was also significantly higher than yields for the fryer-roaster turkeys. After turkeys were roasted at 325°F. in open pans, the

percentage yield of total cooked edible portion for toms 26 weeks old was not significantly higher than yields for younger hens and toms. Roasting shrinkage was significantly higher for older toms than for younger turkeys.—*M. T. Swickard.* (Biological Abstracts)

**VALANTINAS, JUOZAS.**
STAINING OF POULTRY DUE TO WOODEN CRATES. *Jour. Amer. Vet. Med. Assoc. 124(925):* 297. 1954.—Dressed poultry stored in iced crates may develop a bluish color. This is due to the moisture dissolving tannic acid from the wood and becoming discolored on contact with iron from the crates.—*J. F. Ryff.* (Biological Abstracts)

## MANAGEMENT

**FRENCH, M. H., and LEDGER, H. P.** 1954.
THE DEEP-LITTER SYSTEM. *E. Afr. agric. J., 20:* 40-44.—Cambars, Legbars and Welsummers were used in an experiment to test the value of the deep-litter system of poultry management under East African conditions. Egg production during their first laying year was recorded and compared for 3 groups of each breed kept on deep litter, on grass runs with deep-litter houses, and on grass runs with bare-floored houses resp. Yields are tabulated. The over-all results showed the Cambars to be better layers (significant at 0.1% level) than the Legbars and Welsummers; these 2 breeds had similar yields. Total output for all breeds according to system of management did not differ between birds on the 2 deep-litter systems; it was significantly (1% level) higher on grass runs with bare-floored houses. There was, however, a breed variation in response to the deep-litter system: the Cambars and Legbars gave significantly higher yields (5% level) without deep litter, while the yield of the Welsummers was much the same under all 3 systems. Although highly significant variations in yield occurred between months, they could not be related to prevailing climatic conditions. (Animal Breeding Abstracts)

**HAVERMANN, H., and WEGNER, R.** (Abteilung Kleintierzucht und -haltung des Instituts für Tierzucht und Tierfütterung der Universität Bonn.)
SEXING RHODE ISLAND REDS AND NEW HAMPSHIRE CHICKENS BY THE WING DOWN COLOUR. *Archiv für Geflügelkunde. 18:* 165. 1954.—Experiments were conducted concerning the possibility of sexing Rhode Island Reds and New Hampshire chickens by the wing down colour described of Jaap and Kosin. 1244 New Hampshire chickens were sexed with an accuracy of 77.7%. It is to be hoped to improve accuracy in sexing having more experience.

**SKALLER, F., T. E. ALLEN, and B. L. SHELDON.** (Poultry Res. Centre, Werribee, Vic.)
THE EFFECT OF INTENSITY OF DAYLIGHT ON EGG PRODUCTION OF FOWLS IN CAGES. *Australian Jour. Agric. Res. 5:* 578-583. 1954.—Fowls kept in individual laying cages may be exposed to very different intensities of daylight according to the position of the cage in relation to the source of light. Daylight-intensity readings in 2 buildings housing laying-sage batteries varied from 1-8 ft. candles at 4:30 p.m. and 7-11 ft. candles at 9:30 a.m., in positions of low light, to 16-35 ft. candles at 4:30 p.m. and 65-172 ft. candles at 9:30 a.m. in positions of high light. Analysis of records from 170 pullets from selected positions showed no significant difference among egg production of birds exposed to this range of light intensities.—*Auth. summ.* (Biological Abstracts)

**TRETJJAKOV, N. P., and PELJTCER, S. O.** 1954.
PRAKTICESKOE PRIMENENIE NOVOGO METODA OTBORA JAIC DLJA INKUBACII POSLE PREDVARITELJNOGO IH PROGREVANIJA. [THE PRACTICAL APPLICATION OF A NEW METHOD OF SELECTING EGGS FOR INCUBATION AFTER PRELIMINARY HEATING.] *Inkubacija jaic seljskohozjaistvennoi pticy.* [*Incuba-*

*tion of the eggs of domestic birds.*] *Trud. nauc.-issled. Inst. Pticev., 24:* 176-184.—The method already noted is described. By using this method in 1952 av. hatchability was increased from 76-77% to 87-89%.—*G. R. R.* (Animal Breeding Abstracts)

## GENERAL

**BONADONNA, T., POZZI, G. C.,** and **OLGIATI, L.** 1954. (1st Sper. Ital. "L. Spallanzani" Fecond. Artif. Milan.)
PARTICULAR STAINING REACTIONS IN FOWL SPERMATOZOA. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 71-78. (Animal Breeding Abstracts)

**BONADONNA, T., POZZI, G. C.,** and **OLGIATI, L.** 1954.
PARTICOLARI "REAZIONI" TINTORIALI DEI NEMASPERMI DI *GALLUS GALLUS.* [SOME STAINING "REACTIONS" OF THE SPERMATOZOA OF *G. GALLUS.*] *Zootec. e Vet., 9:* 293-303.—Comparative investigations were made of a number of staining methods with a view to ascertaining primarily their suitability for routine observations on the morphology of fowl sperm. Osmic acid was found to be the best fixative and Bengal red + Victoria blue the best stain for semen smears. (Animal Breeding Abstracts)

**FELTWELL, R.** 1954.
DEVELOPMENT OF THE BRITISH TURKEY INDUSTRY. *Sect. Pap. 10th World's Poult. Cong.* [*Edinb.*], 1954: 332-335.—Turkeys were probably first introduced into the United Kingdom from Spain some time between 1525 and 1532. Modern interest in turkey production has greatly increased since the establishment in 1951 of the British Turkey Federation which aims at promoting and encouraging turkey research, improving turkey quality, and increasing consumption at all times of year. In 1952 approx. 1,119,000 turkeys with a gross weight of 7000 tons were slaughtered in the United Kingdom, representing 5 oz. of turkey meat per year per head of population. In June 1953 the total number of turkeys on agricultural holdings of 1 acre and over was 1,514,000. The majority of the turkeys are produced in the counties of Norfolk, Suffolk, Hampshire and Buckinghamshire. The most popular breeds are the Bronze (90% of the total), White (8%), and Norfolk Black (2%). Breeing aims, turkey research, and organized marketing of turkeys are discussed. (Animal Breeding Abstracts)

**HILL, D. H.** 1954. (Fac. Agric., Univ. Coll., Ibadan.)
POULTRY PRODUCTION IN NIGERIA. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 318-321.—Although the poultry industry of Nigeria is not extensive and the standard of husbandry is not high, the hardy breeds and varieties of West African poultry form an integral part of the social structure and economy of the country. The Nigerian fowl is similar in conformation and pattern to the native birds found in other parts of West Africa. Plumage colour is variable. The live weight of hens is 1-2 lb.; that of cocks is 1½-4 lb. The higher weights are often the result of interbreeding with imported birds. The hens lead a semi-wild existence and fend for themselves and their chicks. Each hen annually lays 40-80 eggs weighing 1-1¼ oz. Guinea fowls *(Numida Meleagris galeata* and *Guttera edouardi pallasi),* Muscovy ducks, pigeons and turkeys are reared or exploited to some extent, and small numbers of Khaki Campbell ducks and Chinese geese have been imported for experimental purposes.

Village poultry improvement schemes have been introduced in an attempt to improve the local fowls by crossbreeding with imported R.I.R. cockerels, and marked improvement has been observed in the size and appearance of the fowls in villages where such schemes are in operation. Purebred fowls have not generally done well, however, and losses of up to 65% were reported in 1953. Future policy will probably favour the distribution of ¾-bred R.I.R. stock.

Information on incubation and hatchery practice, systems of rearing and management, marketing, and poultry diseases is included. (Animal Breeding Abstracts)

**IYER, S. G.** 1954. (Indian Vet. Res. Inst., Izatnagar.)
POULTRY IMPROVEMENT IN INDIA. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 321-323.—The total poultry population of India is 69 million, consisting mostly of nondescript varieties. The total number of improved birds is only about 1.4%. The indigenous fowls include the Aseel, Teni, Naked Neck, Chittagong, Punjab Brown, Ghagu, Lolab, Karaknath, Kashmir, Faverole, Titri, Busra, Tellicherry, Denki and Kalapasti. These birds weigh 2-3 lb. at maturity, depending on sex. Village hens are kept under primitive conditions of feeding and management and ordinarily lay 4 or 5 clutches of about 10 eggs per year, the av. weight of each egg being about an ounce. The hatchability of fertile eggs is about 75%. Attempts have been made to improve indigenous stock by crossing with imported breeds, such at the White Leghorn, R.I.R., Barred Plymouth Rock, Black Minorca and Australorp.
Notes are included on feeding, housing, marketing, and research. (Animal Breeding Abstracts)

**KARPOFF, E.** 1954. (U.S. Dep. Agric., Washington, D.C.)
THE BROILER INDUSTRY IN THE UNITED STATES: FACTORS IN ITS RAPID EXPANSION. *Sect. Pap. 10th World's Poult. Cong.* [*Edinb.*], 1954: 292-295. (Animal Breeding Abstracts)

**McARDLE, A. A.** 1954.
THE 1953-54 OFFICIAL EGG-LAYING COMPETITION. *J. Dep. Agric. S. Aust., 58:* 75-84.—Performance in the 25th competition, held at Parafield Poultry Station, was higher than in previous years. Average production was 210.06 eggs per bird, of which 196.7 were 1st grade. In the major classes White Leghorns averaged 217.11, Australorps 211.42, and R.I.R.'s 190.92 eggs per bird, and 57.22% of all birds exceeded 200 eggs. The record for production for 6 birds of any breed was again broken, a W.L. team laying 1472 first grade eggs (an average of 245.3). (Animal Breeding Abstracts)

**MacLEOD, M. M.,** and **BEILBY, O. J.** 1954. (Dep. Agric. Scotland, Edinburgh.)
THE POULTRY INDUSTRY IN SCOTLAND. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 315-318.—Trends in the poultry industry between 1913 and 1953 are indicated. On 4th June 1953 fowls numbered 9,532,106, ducks 179,908, turkeys 121,064, and geese 42,473. Nearly 50% of the total poultry population is in the north-eastern counties (particularly Aberdeenshire and Orkney). The output of eggs and poultry in the country in the year 1952-53 was valued at £17,831,000 and represented 12.3% of the gross farm output. Attention is drawn to facilities for education and research and to the various stock improvement schemes. (Animal Breeding Abstracts)

**SUWAN, L.** 1954. (Kasetsart Univ., Bangkok.)
POULTRY DEVELOPMENT IN THAILAND. *Sect. Pap. 10th World's Poult. Congr.* ([*Edinb.*], 1954: 324-326.—According to the latest available figures the poultry population of Thailand consists of 47,000,000 fowls, 17,000,000 ducks, 200,000 geese, 1000 turkeys and 20,000 pigeons. The 3 native breeds of fowl are the "Kai-oo," which is the Aseel or fighting-cock breed, the "Kaijay" or jungle fowl breed, and the "Kai-ta-pao" or Cantonese breed. The Kai-oo is a poor layer, producing only about 50-60 eggs a year if well fed, but most of the poultry meat eaten in Thailand comes from this breed. The Kai-jay is also a meat breed. The Kai-ta-pao is kept for both eggs and meat; these are of better quality than in the other 2 breeds.
The ducks of Thailand are mainly of mixed ancestry. A small type is used for egg production, while meat is obtained chiefly from the white Pekin duck and from crosses between the native duck and the Muscovy. Duck raising is an important industry, about 250 million duck eggs being produced annually. Exports to Singapore and Malaya, which

ceased during the war, are now being resumed. The geese are mainly Chinese, and the turkeys and pigeons mainly mongrel.

Importations by the Kasetsart University of good laying strains of S.C. White Leghorn, R.I.R., Barred Plymouth Rock and New Hampshire fowls from the U.S.A., and of Australorps from Australia, have been outstandingly successful. These birds and their crosses (highest record 322 eggs in 365 days) have formed the basis of an expanded poultry industry. The Poultry Promotion Association of Thailand now has 2500 members and sponsors an annual egg-laying contest.

The battery system of egg production was introduced by the Kasetsart University in 1949 and has proved very successful. Artificial insemination is used at the University in order to breed from the caged birds. Av. fertility is around 90%. Chick sexing by means of a sexoscope has given results which are 100% accurate. (Animal Breeding Abstracts)

**TERMOHLEN, W. D.** 1954.
CHANGING PATTERNS IN THE POULTRY INDUSTRY. *Sect. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 309-312.—The av. per capita consumption of turkeys in the U.S.A. increased from 2.6 lb. in 1935-39 to 5.6 lb. in 1952. (Animal Breeding Abstracts)

**VONSBAEK, N.** 1954.
FJERKRAEHOLDET I 1953. [POULTRY IN 1953.] *Tidsskr. Landokon.*, 1954 (5): 237-250.—In Denmark in July 1953 there were 24,251,000 fowls, 659,000 ducks, 245,000 geese and 37,000 turkeys. Production averaged 160 eggs per hen in 1953. Details are given on egg and poultry meat exports. (Animal Breeding Abstracts)

**WILKINSON, A. D.** 1954.
NATIONAL LAYING TEST, 1953-54. REPORT FOR THE TWELFTH PERIOD OF FOUR WEEKS AUGUST 17TH TO SEPTEMBER 13TH, 1954. *Poult. Ind., 19:* 565-566.—The test [held at Milford, Surrey] ended with an over-all average of 193.29 eggs per bird [entered] v. 192.37 for 1952-53 and 190.08 for all post-war tests. R.I.R.'s were at the top of the breed averages with 205.67 eggs. Losses, comprising dead and unfit birds, averaged 9.73%. (Animal Breeding Abstracts)

**WILTZER, A.** 1954.
UNIFICATION D UJUGEMENT DANS LES EXPOSITIONS INTERNATIONALES. [STANDARDIZATION OF JUDGING AT INTER NATIONAL EXHIBITIONS.] *Sec. Pap. 10th World's Poult. Congr.* [*Edinb.*], 1954: 351-352.—It is suggested, *inter alia*, that common breed standards should be adopted in all countries, that the method of judging should be uniform, that the term "international" should be reserved for large exhibitions of recognized international status, and that there should be some common standard in the classification of serious and hereditary defects. (Animal Breeding Abstracts)

---

## ADDITIONS TO MEMBERSHIP LIST
## WORLD'S POULTRY SCIENCE ASSOCIATION

(Received since last issue)

### AUSTRALIA

A. J. Flack, Williams Road, Horsham, Victoria

L. Gaffney, 94 Holmfirth Street, Mount Lawley, Western Australia

E. E. Gallus, Centre Road, Vermont, Victoria

D. K. Giles, Department of Agriculture, St. Georges Terrace, Perth, Western Australia

G. W. Grenville, Springvale Road, Springvale, Victoria

Mrs. G. Hocking, 22 Sherbrooke Avenue, Ringwood, Victoria
J. B. Horsfall, High Street, Doncaster, Victoria
A. A. McArdle, 90 Gladstone Road, Brighton, South Australia
R. H. Morris, Department of Agriculture, St. Georges Terrace, Perth, Western Australia
Paul Nemet, Springvale Road, Springvale South, Victoria
W. D. Pederick, Norman Lodge, Mt. Eliza, South Victoria
T. H. Pettigrove, Fulton Road, Blackburn South, Victoria
H. L. Taylor, 180 Surrey Road, Blackburn, Victoria

**AUSTRIA**

Dr. T. Stonborough, Kundmanngasse 19, Vienna III

**BELGIUM**

Gaston Van Roey, 36 Avenue van Beneden, Malines

**CANADA**

D. R. Clandinin, Poultry Division, University of Alberta, Edmonton

**ENGLAND**

J. A. Binstead, Nat. Inst. of Poultry Husb., Newport, Shropshire
Miss H. Blomfield, Harper Adams Agr. Coll., Newport, Shopshire
H. P. Chu, The Veterinary School, Madingley Road, Cambridge
W. W. Roy Jennings, Norland Farm, Flackwell Heath, High Wycombe, Buckinghamshire
Thomas L. Keen, Purley Park Poultry Farm, Reading, Berks.
A. J. Rainford, The Land Settlement Assoc., Ltd., 43 Cromwell Road, London, SW 7

**ITALY**

Count A. A. di Altoe, Corso Vittorio Emanuele II, Piacenza
Franco Buldini, Centro Avicolo, via S. Giacomo, 9, Bologna
Gastone Moncada, Villa Trabia, Bagheria (Palermo)

**JAPAN**

Shizuhiko Goto, 7-Chome, Nishino-machi, Gifu City

**NETHERLANDS**

E. J. H. M. Hendrix, 65a Spoorstraat, Boxmeer
A. H. J. Visschedijk, 33 bis Peter Nieuwlandstraat, Utrecht
J. S. v.d. Wielen, % Oliefabrieken Calvé Delft, Delft
D. M. Zuydam, 931 Dordtsestraatweg, Rotterdam

**SOUTH AFRICA**

Dr. R. B. Cumming, P.O. Box 1, Sandown, Johannesburg
Miss K. Fletcher, Freeland, P.O. Highflats, Natal

**SWEDEN**

Stig Holmberg, Grimbellon, Torskinge

**AGRICULTURAL COMPANY OF PAN AMERICA**

**GUILFORD, CONN., U.S.A.**

World Shippers of Hatching Eggs, Chicks, Breeding Stock and Poultry Equipment of all kinds.

**CHICKS SHIPPED IN ANY QUANTITY FROM A FEW HUNDRED TO PLANE-LOADS**

**WE HANDLE**

U.S. Pullorum Clean chicks, turkey poults, chicken, turkey and duck hatching eggs

Feeds

Vaccines

Poultry and Dairy Equipment

**We Ship** only the best U.S. products from leading breeders and manufacturers.
**We Provide** the most efficient service possible
**We Give** personal attention to each order
**We Make** it easy for world customers to buy in the United States
**We Ship** by air or ocean to any country in the world.

YOUR INQUIRIES ARE INVITED.

**AGRICULTURAL COMPANY OF PAN AMERICA**

**GUILFORD, CONN., U.S.A.**


## BRANCH NEWS—UNITED KINGDOM

The U.K. Branch have arranged for one of their two annual conferences to take place on the occasion of the National Poultry Show at Olympia, London, December 7-9, 1955. The conference will take place on the afternoon of December 8 and visitors from other countries who may be visiting the Show are cordially invited to attend. The subject will be "Hybrids, Crosses or Purebreds—The Best for Commercial Egg Production." Mr. Y. Watanabe will champion Crosses and Purebreds, Mr. C. Thornber the Hybrids. The fact that these internationally known breeders will take part is a guarantee of the quality of the conference. The papers will be followed by an open discussion after which Mr. G. E. Mann, who is a well known geneticist, will sum-up.

# Sharper Grit Grinding Edges Release More Nutrients From Grains and Grasses

HELPS LAYERS PRODUCE MORE EGGS WITH LESS FEED

GRAN-I-GRIT is the most attractive Grit on the market. The special built modern cutting equipment we use in producing GRAN-I-GRIT, produces edges that are always extra sharp.

Sharper griding edges grind feed better and finer. Finer grinding of feed and grasses releases additional nutrients which permits birds to get more body building nourishment from their feed . . . this helps improve livability of chicks, growing stock and layers.

GRAN-I-GRIT is insoluble. It will not disolve and cannot change the mineral balance in the feed used.

SPEEDS GROWTH AND FEED CONVERSION OF BROILERS

## GRANITE GRIT INSTITUTE

We are members of the Granite Grit Institute of America which has for the past several years performed extensive research regarding the value of feeding grit to chicks, broilers and layers. We will be glad to supply you with copies of the results obtained through the extensive tests made.

# GRAN-I-GRIT

**THE GRIT WITH THE SHARPEST GRINDING EDGES EVER CUT**

**NORTH CAROLINA GRANITE CORPORATION**
**MOUNT AIRY, NORTH CAROLINA**

# MAXIMUM EFFECTIVENESS with MINIMUM DRUG DOSAGE!

**Whitmoyer WHITSYN uses important medical principles of SYNERGISM and MULTIPLE BLOCKING for effective coccidiosis control**

Two important medical principles—never before applied to coccidiosis control — combine in WHITSYN to give poultrymen a "minimum drug dosage" product that is effective against all types of coccidiosis—stubborn intestinal as well as cecal. These two principles are SYNERGISM and MULTIPLE BLOCKING.

SNYERGISM: Whitmoyer scientists discovered that 2 powerful anti-coccidial drugs, used in combination, control this disease many, many times more effectively than would normally be expected by adding the individual effect of each drug. Each makes the other work better.

MULTIPLE BLOCKING: Whitmoyer also discovered that these two synergistic drugs attacked the coccidial organism at not just one, but at several vital spots simultaneously. WHITSYN has a multiple action.

WHITSYN has been used successfully where hemorrhagic disease complicates the coccidiosis without further aggravating the tendency to hemorrhage. There is apparently less tendency to undesirable side effects because the synergistic action makes lower than normal drug levels so highly effective.

WHITSYN is available in three easy-to-use forms:

(1) WHITSYN-5 for control of outbreaks of coccidiosis

(2) WHITSYN-10 for prevention.

(3) WHITSYN-S for treatment in the drinking water.

We welcome your inquiries for additional data on WHITSYN and other Whitmoyer Products . . . or for consultation with our staff members on disease or nutritional matters.

Whitmoyer LABORATORIES INC
*Manufacturing Chemists*
MYERSTOWN, PENNA., U.S.A.

**WHITSYN**

---

**"PRODUCTS OF SCIENTIFIC MERIT"**

---

# *Give your birds "teeth"*

## to grind their feed!

## Get faster growth
## Cut feeding costs
## WITH STONEMO GRANITE GRIT

Your birds need "teeth" to help them make better use of their feed... grow faster... reduce your feeding costs! Give them insoluble STONEMO Granite Grit.

**HELPS SPEED GROWTH**—STONEMO's extra grinding surfaces help grind feed extra fine in the gizzard...crush grains and grasses ...grind open many cellulose "capsules" in feed. This releases *more body-building nutrients* for faster growth and development.

**HELPS SAVE FEED DOLLARS**—STONEMO helps make your feed work harder... helps produce big, sturdy birds at less cost. You save money—step up profits!

**GET STONEMO TODAY!**—Put real "teeth" in your feeding program now. Get STONEMO Granite Grit in handy 10-lb. HOPPER-PAKS, or 25, 50 or 80-lb. economy bags. The easy-to-use HOPPER-PAK has trays to pull out to make a convenient hopper. It saves work—saves time! See your hatchery, feed or poultry supply dealer *today*.

**FOLLOW THESE 3 STEPS TO GROW BIG, STURDY BIRDS!**

**FINE SIZE STONEMO**
**First 2 days**—Feed fine chick grains and fine-size STONEMO. Mix 10 lbs. grain to 1 lb. grit.
**3 days to 4 weeks**—Start feeding mash... give fine-size STONEMO in HOPPER-PAK, or hoppers.

**MEDIUM SIZE STONEMO**
**4 weeks to 8-10 weeks**—Gradually switch to medium-size STONEMO—then keep hoppers full.

**COARSE SIZE STONEMO**
**8-10 weeks on**—Switch to coarse-size STONEMO. Then keep it before birds at all times... during growing period and in laying house.

**STONE MOUNTAIN GRIT COMPANY, INC.**
Executive Offices and Quarry: LITHONIA, GA.
Branch Quarry: BARRE, VERMONT

## DR. SALSBURY'S POULTRY SCIENTISTS

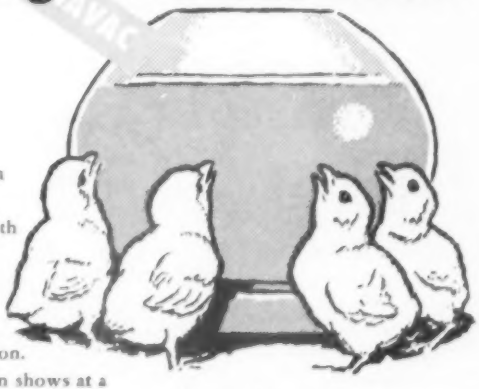
bring *new convenience*

to vaccination for
newcastle disease—
infectious bronchitis

DR. SALSBURY'S **WAVAC**

# drinking water vaccines

✓ DEHYDRATED
✓ STABILIZED



A distinct improvement over early live virus, glycerinated liquid vaccines accompanied by a stabilizer, DR. SALSBURY'S *New* WAVAC vaccines are dehydrated and combined with the stabilizer in a single bottle. The blend makes vaccination even easier for the poultry raiser and more convenient for dealers to handle and store requiring only ordinary (45° F.) refrigeration.

New WAVAC color identification shows at a glance what vaccine birds are consuming —brings still another measure of safety to the user.

Comprehensive tests prove WAVAC efficiency high—without danger of overdosage. Recommended program for new DR. SALSBURY'S WAVAC vaccines permit vaccination at four days, four weeks and sixteen weeks with boosters every three months to provide maximum protection throughout the laying period.

This refinement of product and continuing testing to expand the data on product use typifies the work to which DR. SALSBURY'S LABORATORIES is devoted.

WAVAC is packaged in 500 and 1,000 dose bottles. Write for samples and authoritative data on Drinking Water Vaccines.

**Three Types Each Identified By COLOR**

**WAVAC**
Newcastle Disease Vaccine (B1 strain)
**COLORS WATER BLUE-GREEN**

**WAVAC**
Infectious Bronchitis Vaccine
**COLORS WATER YELLOW**

**WAVAC**
Combination Newcastle Disease (B1 strain) and Infectious Bronchitis Vaccine
**COLORS WATER PINK**

**DR. SALSBURY'S LABORATORIES** • Charles City, Iowa

a complete line of poultry medicines

Dr. SALSBURY'S

536WV; World Poultry Science; 3rd Quarter.
A2-0611; N. A. WINTER ADVERTISING AGENCY

# Aurofac®

AUREOMYCIN* Chlortetracycline and Vitamin $B_{12}$ Mixture

## STILL A LEADER IN THE FIELD OF POULTRY NUTRITION

**AUROFAC** the first and most widely used antibiotic feed supplement, has now been shown to exert even greater activity when fed continuously at levels of 50 to 200 grams per ton of feed.

The incidence of such debilitating diseases as CRD, blue comb, sinusitis and nonspecific enteritis is markedly reduced in flocks which receive continuous high levels of AUREOMYCIN Chlortetracycline in the ration. It has also been observed that high levels of AUREOMYCIN increase the rate of growth and feed efficiency, and reduce the number of death losses and culls when fed uninterruptedly from hatching until marketing. In layer flocks, egg production, hatchability and livability of chicks are often considerably improved.

Extensive field trials, involving over 2,000,000 birds, have proved that continuous high level feeding of AUREOMYCIN is highly effective and economically practical under actual poultry-raising conditions.

For further information on AUROFAC Feed Supplement and the new program of High Level Feeding of AUREOMYCIN, write to the address below: *Trade-Mark

AMERICAN Cyanamid COMPANY

Cyanamid Fine Chemicals

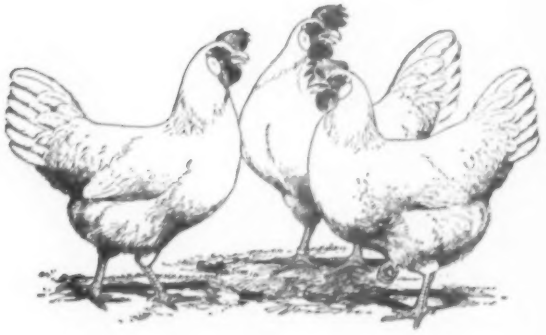
Fine Chemicals Division

30 Rockefeller Plaza, New York 20, N. Y.

NEW HIGH-EFFICIENCY FUL-O-PEP

BRINGS HENS INTO

# Top Egg Production–Quick!



***MAKES THEM LAY TO THE LIMIT.*** New high-efficiency egg mashes will help make hens come into top production, quick—and keep them there. For actual tests at the Ful-O-Pep Research Farm show that 2,000 hens fed new high-efficiency Ful-O-Pep for the past 10 months have laid at the rate of 240 eggs per year on the hen-housed basis.

***HELPS POULTRYMEN BOOST EGG PROFITS.*** Efficiency—not energy—is the key to egg profits. That's why Ful-O-Pep is carefully fortified to assure maximum assimilation of all nutrients . . . to enable poultrymen to get maximum efficiency from the feed they buy. Yes, nutritional leadership and proved performance is the story of Ful-O-Pep . . . a story of profit to poultrymen.

**THE QUAKER OATS COMPANY**

*. . . makers of dependable feeds for over 65 years*

## Merck Offers a Superior New Coccidiostat

# NiCarbazin

NiCarbazin is an entirely new chemical* developed by Merck especially for the *prevention* of coccidiosis outbreaks in chickens. It is more effective than any other coccidiostat for continuous preventive use in feeds.

Extensive laboratory and field trials have established the following advantages of NiCarbazin:

**1.** Attacks coccidia early in the life cycle—eliminates bloody droppings.
**2.** Has cut deaths from coccidiosis to *zero*, in repeated tests, even when losses in untreated birds were as high as 60 per cent.
**3.** Prevents intestinal damage which causes unthriftiness and downgrading.
**4.** Allows development of natural immunity.
**5.** Permits exposed birds to make better weight gains with greater feed efficiency.
**6.** Enables producers to get more high-quality birds to market at premium prices or to bring more replacement birds through the growing period when coccidiosis is a major hazard.

---

NiCarbazin is available in the poultry feeds of leading manufacturers. Used continuously, such feeds offer the most complete protection available against coccidiosis outbreaks.

**NiCarbazin is a complex of 4,4'-dinitrocarbanilide and 2-hydroxy-4,6-dimethylpyrimidine.*

---

**NiCarbazin Means No Coccidiosis Problem**

© Merck & Co., Inc.

MERCK & CO., INC.
*Manufacturing Chemists*
RAHWAY, NEW JERSEY

ADVERTISEMENT — This is a paid advertisement Prepared by U. S. Industrial Chemicals Co.

# U.S.I. FEED NEWS

★ A SERIES FOR SCIENTISTS AND EXECUTIVES OF THE FEED MANUFACTURING INDUSTRY ★

## Effectiveness of Energy-Protein Ratio Depends on Proper Amino Acid Balance

It is felt by some authorities that the important biological factor of protein quality is oftentimes overshadowed or overlooked due to the significance attached to the mathematical value of a protein-energy ratio. For highest feed efficiency at lowest feed cost, protein quality must be looked upon as being just as important as the amount of protein in the diet.

Proper amino acid balance — the most accurate indication of protein quality — is essential, otherwise the animal cannot make efficient use of the energy and other nutrients in the ration. In fact, a deficiency of an essential amino acid can cause failure of the entire diet.

Methionine is one of the essential sulfur amino acids necessary for proper amino acid balance and is the one most likely to be deficient in poultry starting rations. Experiments and field results have proved beyond doubt that supplemental methionine will increase feed efficiency and improve feathering and market finish of birds.

Price reductions during the past year make it more practical than ever to include methionine in formulations. In addition, U.S.I. has a wall chart, handy formula, and work sheets that make it simple and easy to estimate methionine requirements of a poultry ration in relation to the energy level. Copies free on request. Write Editor.

## DL-METHIONINE FOR HIGH ENERGY RATIONS

U.S.I. is the pioneer producer of methionine, the low-cost, essential amino acid. Rations that are supplemented with DL-Methionine produce increased return over feed costs and a more rapid growth rate. Methionine is also effective in improving feathering. Your best supply — from U.S.I.

## U.S.I. Feed News A Regular Feature

Each month U.S.I. publishes a full page FEED NEWS in the leading publications reaching nutritional and feed formulation specialists. Informative items of interest to all who use feeds and feed supplements are included. Follow this series in U.S. feed publications for new developments in the poultry feeding industry, or send us your name, address and title on your company letterhead to be placed on our mailing list.

## B COMPLEX VITAMINS AID GROWTH OF BIRDS

Addition of B-complex vitamins to poultry feed increases growth rate; helps produce more uniform, full-fleshed birds; aids in protein and carbohydrate utilization. U.S.I. supplies choline chloride, calcium pantothenate (dextrorotatory), niacin U.S.P., Riboflavin, Vitamin $B_{12}$ and Choline Chloride.


FEED PRODUCTS OF U.S.I.

- VACATONE 40* (molasses distillers dried solubles)
- U.S.I. VITAMIN $B_{12}$ AND ANTIBIOTIC FEED SUPPLEMENTS
- U.S.I. CHOLINE CHLORIDE (25% dry or 70% solution)
- U.S.I. MENADIONE MIXES (vitamin $K_3$)
- U.S.I. RIBOFLAVIN Products
- U.S.I. NIACIN
- U.S.I. CALCIUM PANTOTHENATE Products
- U.S.I. DL-METHIONINE (feed grade)
- U.S.I. VITAMIN A & D Products (stabilized)
- USIMIX* Vitamin Premixes (vitamins and antibiotics to meet your specifications)

*Reg. U.S. Pat. Off.

BRANCHES IN ALL PRINCIPAL CITIES

U.S. INDUSTRIAL CHEMICALS CO.

Division of National Distillers Products Corporation
99 Park Avenue, New York 16, N. Y.

# Successful Poultry Breeding Needs More Brains Than Arms . . .

*Any Trouble? . . .* *Apply Freely To*

BUREAU OF INTERNATIONAL B.N.A SCIENTIFIC ASSOCIATION ANIMAL NUTRITION

PRESIDENT: J. PÉRUCHON DE BROCHARD

## *Why?*

Because the Bureau of Animal Nutrition Extension Service allows every poultry man to get more technical assistance in his activity. — It groups information and discoveries in poultry breeding throughout the world. —

### At your disposal NOW:

- **THE LENDING LIBRARY.**—The most important technical library in the world on practical poultry breeding.—Technical reports available in several languages.—Copies of these publications are loaned freely in every country.—Ask for list and conditions.—
- **THE TECHNICAL ADVISERS COMMITTEE,** grouping world famous experts on every poultry breeding activity, nutrition, genetics, management, hatching, housing, etc. . . Free consultations on request.
- **NUTRITIONAL APPROVAL AND GUARANTEE SERVICE.**—In every country commercial diets bearing the sign of the B.N.A. are the best, because their formulas are approved and their manufacturers chosen among leaders.—

*FOR FULL INFORMATION WRITE TO:*

**BUREAU OF ANIMAL NUTRITION —B.N.A.**

**81 a, Sylvabelle St., MARSEILLE (6), France**